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FM 101-10-1

DEPARTMENT OF THE ARMY FIELD MANUAL

STAFF OFFICERS' FIELD MANUAL ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA UNCLASSIFIED DATA

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HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1969

FIELD MANUAL
No. 101-10-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *10 January 1969*

Staff Officers' Field Manual

ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA

UNCLASSIFIED DATA

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By Order of the Secretary of the Army:

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Distribution:
To be distributed in accordance with DA Form 12–11 requirements for Staff Officers' Field Manual Organization, Technical and Logistical Data, Part 1.

CHAPTER 1

ORGANIZATION

Section I. GENERAL

1–1. Purpose and Scope

a. Purpose. This manual is for use as a planning guide only. It provides general planning data for staff officers of all echelons. Detailed reference data are found in tables of organization and equipment (TOE), field manuals, technical manuals, technical bulletins, and supply bulletins as outlined in DA Pam 310-series. The principles and procedures of combat service support are contained in FM 100–10; the duties of the staff officers and the principles and procedures of staff action are contained in FM 101–5.

b. Scope. Source cutoff date for material contained in this manual is 1 January 1968. Tables and examples in chapters 1 through 9 are not, in all cases, based on latest TOE; therefore, computations must be adjusted accordingly. The TOE series used in making the calculations is indicated to permit the user to make adjustments, when needed, through the comparison of TOE.

***Caution:* Data contained in this manual are based on experience principally from World War II and the Korean War and can be applied to the future only with judgment and discrimination. Unless specified, these data have been adjusted to reflect current equipment capabilities, rates of fire, and so forth. Planning factors should be modified, as appropriate, to reflect specific requirements of mission, environment, enemy capabilities, and nuclear conditions. Whenever known factors are available, they should be used rather than those from this manual. This manual is applicable to nuclear and nonnuclear warfare.**

FM 101–10, *Staff Officers' Field Manual—Organizational, Technical, and Logistical Data*, consists of three parts published as separate volumes.

FM 101–10–1—Unclassified Data

FM 101–10–2—Extracts of Tables of Organization and Equipment

FM 101–10–3—Classified Data

c. Ten Classes of Supply.

(1) The Joint Chiefs of Staff (JCS) has approved new terminology for classes of supply. Implementation of these classes of supply will be accomplished by 1 January 1969. Because of the magnitude of the task associated with the reclassification of the many items in the Army supply system, and the associated time factor in accomplishing this task, this manual does not include the new 10 classes of supply. A subsequent revision of the manual will incorporate these data as soon as the data become available.

(2) For users of this manual, the following breakout of the JCS-approved 10 classes of supply is provided so that meaningful interpretation of the data can be accomplished in the field:

Major classification	*Subclassification* [1]
I—Subsistence.	A—Air (in-flight rations).
	R—Refrigerated subsistence.
	S—Nonrefrigerated subsistence (less combat rations).
	C—Combat rations.[2]
II—Clothing, individual equipment, tentage, organizational tool sets and tool kits, handtools, administrative, and housekeeping supplies and equipment.	B—Ground support materiel.[3]
	E—General supplies.
	F—Clothing and textiles.
	M—Weapons.
	T—Industrial supplies.[4]

[1] The ALPHA code for subclassification of classes II, VII, and IX represents materiel category designators used in supply management, with the exception of A (Air), which is used throughout all classes of supply as applicable. ALPHA codes not used as materiel category designators have been assigned to the subclassifications for classes I, III, and V. The subclassification materiel designators (A through T) may be used in combination with the designated subclassifications, when appropriate and if desired, to definitize further a portion of a class of supply for planning purposes, e.g., use of class V AL to designate ammunition, air missile. Additional codes may be used by the Services to satisfy a specific requirement, e.g., to designate reparable or nonreparable, high-dollar items, or for other selective management purposes. This additional permissive coding is not to be used in lieu of that designated for the major classification and subclassifications.

[2] Includes gratuitous health and welfare items.

[3] Includes power generators and constructions, barrier, bridging, firefighting, petroleum, and mapping equipment.

[4] Includes hearings, block and tackle, cable, chain, wire rope, screws, bolts, studs, steel rods, plates, and bars.

III—POL, petroleum fuels, lubricants, hydraulic and insulating oils, preservatives, liquid and compressed gases, bulk chemical products, coolants, deicing and antifreeze compounds, together with components and additives of such products, and coal.	A—Air. W—Ground (surface).
IV—Construction: construction materials, to include installed equipment and all fortification/barrier materials.	
V—Ammunition: ammunition of all types (including chemical, biological, radiological, and special weapons), bombs, explosives, mines, fuzes, detonators, pyrotechnics, missiles, rockets, propellants, and other associated items.	A—Air. W—Ground.
VI—Personal-demand items (nonmilitary sales items).	
VII—Major end items: a final combination of end products that are ready for their intended use, e.g., tanks, launchers, mobile machine shop, vehicles.	A—Air. B—Ground support materiel.[3] D—Adminstrative vehicles.[5] G—Electronics. K—Tactical vehicles. L—Missiles. M—Weapons. N—Special weapons.
VIII—Medical materiel, including medical-peculiar repair parts.	
IX—Repair parts (less medical-peculiar repair parts): all repair parts and components, to include kits, assemblies, and subassemblies, reparable and nonreparable, required for maintenance support of all equipment.	A—Air. B—Ground support materiel.[3] D—Administrative vehicles.[5] G—Electronics. K—Tactical vehicles. L—Missiles. M—Weapons. N—Special weapons. T—Industrial supplies.[4]
X—Materiel to support nonmilitary programs, e.g., agricultural and economic development not included in classes I through IX.	

[3] Includes power generators and construction, barrier, bridging, firefighting, petroleum, and mapping equipment.

[4] Includes bearings, block and tackle, cable, chain, wire rope screws, bolts, studs, steel rods, plates, and bars.

[5] Commercial vehicles used in administrative motor pools.

1-2. Recommended Changes

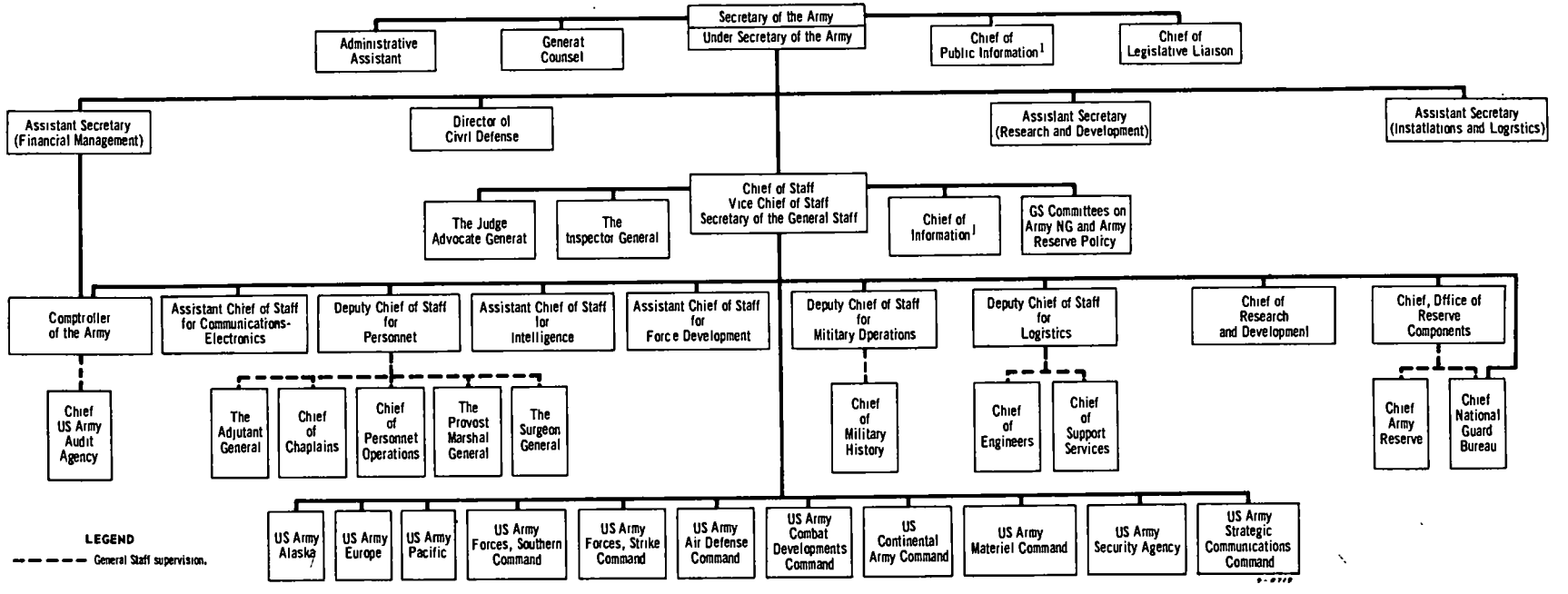
Users of this manual should submit recommendations to improve its clarity or accuracy. They should key comments to the specific page, paragraph, and line of the text in which they recommend a change. Users should provide reasons for each comment to insure understanding and complete evaluation. Users should forward comments to the Commanding General, U.S. Army Combat Developments Command Institute of Combined Arms and Support, Fort Leavenworth, Kansas 66027. Originators of proposed changes that would constitute a significant modification of approved doctrine may send an information copy, through command channels, to the Commanding General, U.S. Army Combat Developments Command, Fort Belvoir, Virginia 22060.

1-3. Department of the Army—Organization

Figure 1-1 depicts the organization of the Department of the Army, comprised of the Army Staff, the oversea commands, the U.S. Continental Army Command (USCONARC), functional commands, and the Army portion of the quick-reaction force (U.S. Army Forces, Strike Command). The functional commands are represented by the U.S. Army Materiel Command, responsible for the testing, evaluation, and procurement of Army materiel; by the U.S. Army Combat Developments Command, responsible for Army doctrine and materiel requirements; by the U.S. Army Strategic Communications Command, responsible for worldwide Army communications; by the U.S. Army Security Agency, responsible for the security of Army communications; and by the U.S. Army Air Defense Command, responsible for the Army portion of North American air defense. USCONARC is responsible for command of the five U.S. Army areas and for Army schools and class II installations.

1-4. Army Areas and U.S. Army Air Defense Command

a. Army Areas. The continental United States (CONUS) is divided into five separate army areas



[1]The Chief of Public Information also serves as Chief of Information.

Figure 1–1. Organization of the Department of the Army

for purposes of decentralizing control and providing the structure for administration of Army schools, logistics for CONUS troops, staging and training areas for deploying troops and materials, and support of the functional commands in CONUS. Figure 1–2 shows the geographic areas of the U.S. armies.

b. U.S. Army Air Defense Command. The U.S.

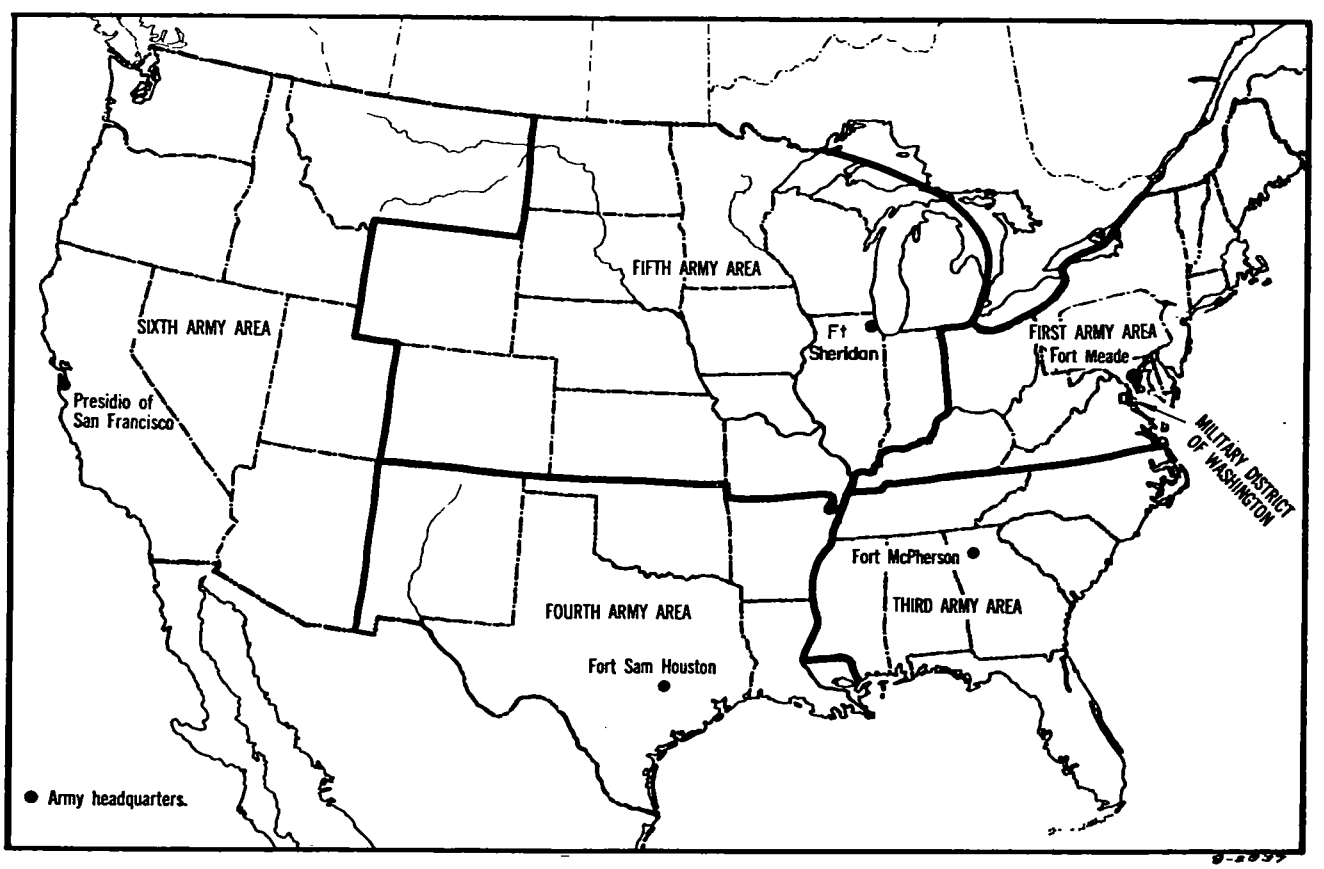


Figure 1–2. U.S. army areas.

Army Air Defense Command (ARADCOM) is one of the three component commands with the mission of furnishing combat-ready forces, including reserves, to the Commander in Chief, North American Air Defense Command (CINCNORAD), for his operational employment. The Commanding General, ARADCOM, commands all Army forces assigned, attached, or otherwise made available to him, less operational control, which he relinquishes to the CINCNORAD. He is directly responsible to all command matters to the Chief of Staff, U.S. Army. Logistic support of the ARADCOM is provided primarily through the Commanding General, USCONARC. The geographic areas that comprise the ARADCOM regions correspond to the geographic areas of the U.S. Air Force, the Military Service directly responsible for the air defense of CONUS. Figure 1–3 shows the geographic regions of the U.S. Army Air Defense Command.

1–5. Theater Army

a. General. In normal operations, the theater of operations is organized as a unified or combined command. The theater army is the senior all-Army organization that includes all U.S. Army individuals, units, detachments, organizations and installations assigned to a theater of operations. It comprises theater army headquarters and subordinate headquarters and commands. It is a major subordinate component command of the unified (theater) command. In wartime, the unified command (theater) commander normally exercises direct operational command of those U.S. Army combat and combat support forces required to carry out the theater operational mission. However, during peacetime, the theater commander usually exercises operational command of U.S. Army forces through the theater army commander.

b. Composition. Figure 1–4 outlines the basic elements of a typical theater army organization. FM 100–15 illustrates the command relationships discussed in *a* above. The commanders of both the field army and the theater army support command (TASCOM) are assigned all the means needed to perform their missions in the combat and the communications zones, subject to policy guidance and direction of the theater army commander.

(1) *Headquarters.* There is no prescribed organization for headquarters, theater army. It consists of the headquarters elements necessary to provide command and control of assigned forces. The allotment and grouping of these forces is based on the mission assigned.

(2) *Assigned forces.* Forces assigned to U.S. theater army may consist of—

(*a*) Combat forces—army groups, field armies, and separate corps, divisions, or brigades.

(*b*) TASCOM.

(*c*) Theater Army Reserve Forces.

(*d*) Air Defense Artillery Brigade.

(*e*) Military Intelligence Group, Theater Army.

(*f*) Special Forces Group.

(*g*) Psychological Operations Group.

(*h*) Civil Affairs Brigade.

(*i*) Special Ammunition Support Command.

1–6. Army Group

a. General. The army group directs the strategic and tactical operations of several field armies or similar tactical groupings. As outlined in paragraph 1–5, it functions in wartime under the direct operational command of the theater commander. Similarly, during wartime in a combined theater, it may function under the operational command of a senior combined command headquarters.

b. Composition.

(1) *Headquarters.* There is no prescribed organization for headquarters, army group. It consists of the headquarters elements necessary to exercise strategic and tactical control of its assigned forces. Army group does not normally operate combat service support installations.

(2) *Assigned forces.* Forces assigned to an army group may consist of—

(*a*) Field armies.

(*b*) Separate corps.

(*c*) Separate divisions.

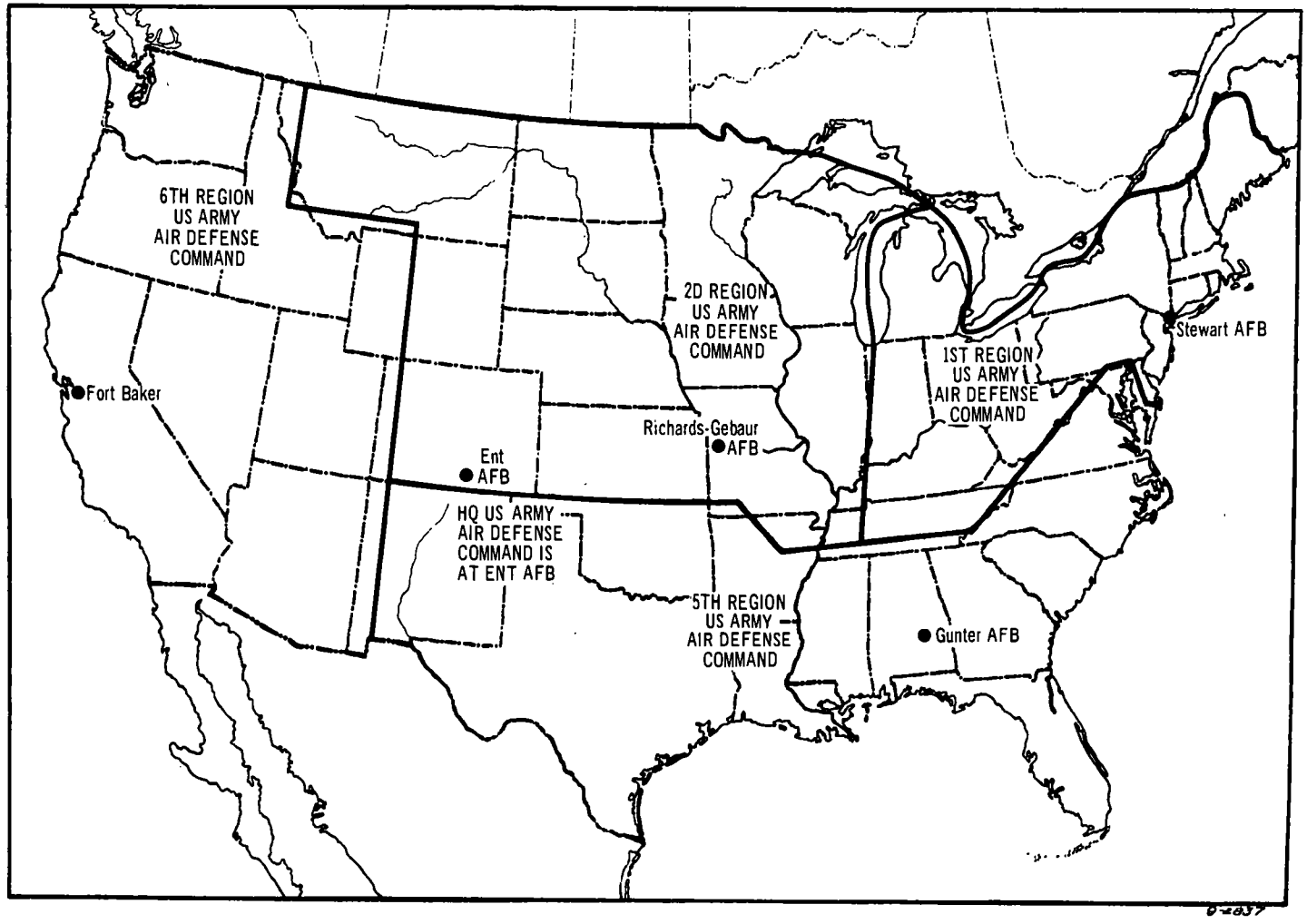
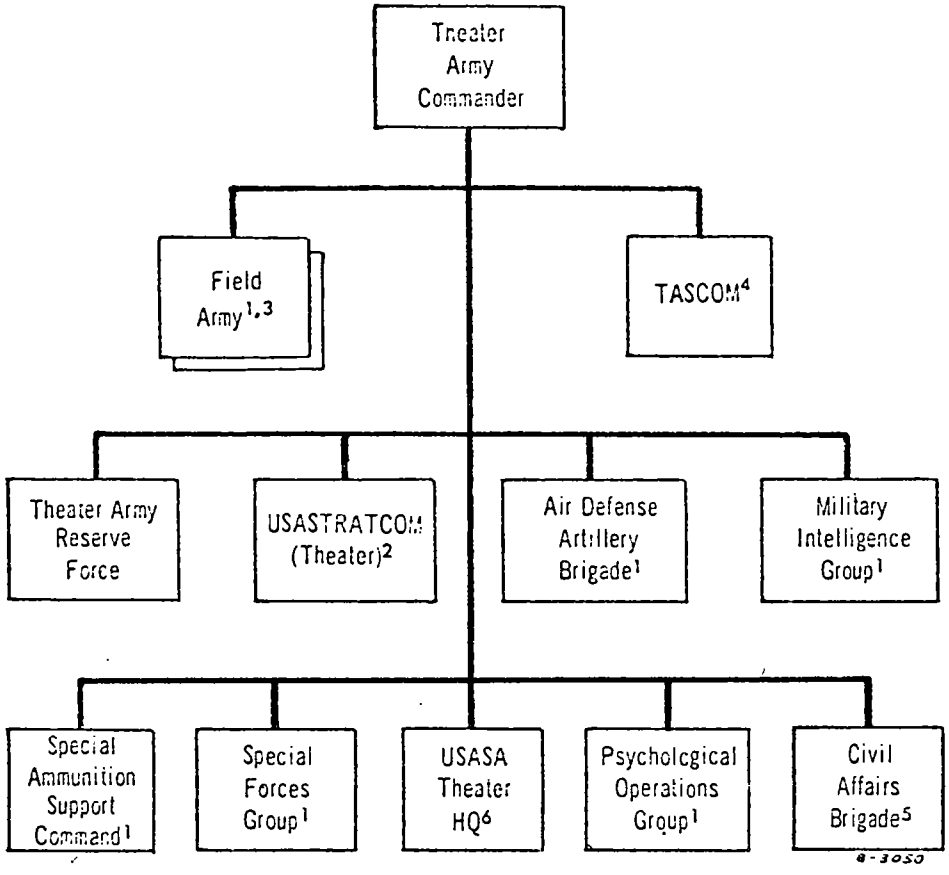


Figure 1-3. ARADCOM regions.



[1]Under the operational command of the unified commander in wartime (except MI Group technical intelligence units)

[2]Under operational control of the theater army commander.

[3]Army groups may be necessary when several field armies are employed.

[4]Functions of HQ TASCOM may be assumed by HQ Theater Army in wartime.

[5]May be assigned or attached to a theater army, TASCOM, or ASCOM and may be under the operational command of of the unified command commander in wartime.

[6]Provides support in accordance with AR 10-122.

Figure 1–4. Theater army structure.

Section II. FIELD ARMY, CORPS, AND FASCOM

1–7. Field Army

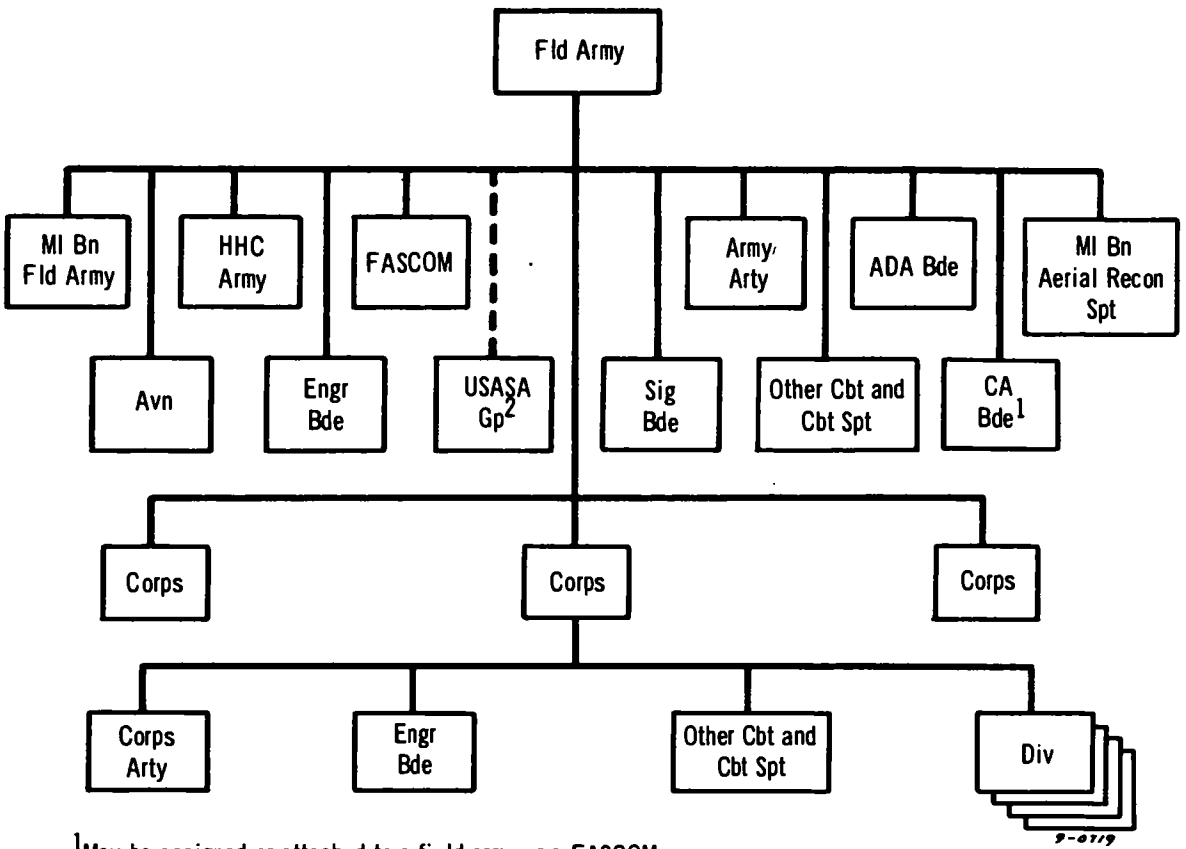
a. General. The field army is a tactical and an administrative organization capable of independent operations. Normally, it consists of a headquarters; certain assigned field army troops; a field army support command and a variable number of corps, divisions, reinforcing combat, and combat support troops.

b. Field Army Headquarters. TOE 51–1 shows the organization of the field army headquarters.

c. Typical Field Army Units. The composition of a typical field army (fig. 1–5) is contained in paragraph 4–2.

1–8. Corps

a. General. When operating as part of a field army, the corps is primarily a tactical organization of execution; however, when operating as an independent or separate corps, it exercises both tactical and administrative functions. The corps consists of a headquarters; certain assigned corps



[1]May be assigned or attached to a field army or a FASCOM.
[2]Provides support in accordance with AR 10-122.

Figure 1–5. Typical field army units.

troops; and a variable number of divisions and reinforcing combat, combat support, and, in the case of an independent or separate corps, combat service support troops.

b. Corps Headquarters. TOE 52–1 shows the composition of corps headquarters.

c. Typical Corps Units. Figure 1–5 shows the units that may be included in a typical corps, with a typical corps comprised of one armored, one infantry, and two infantry (mechanized) divisions.

1–9. Field Army Support Command

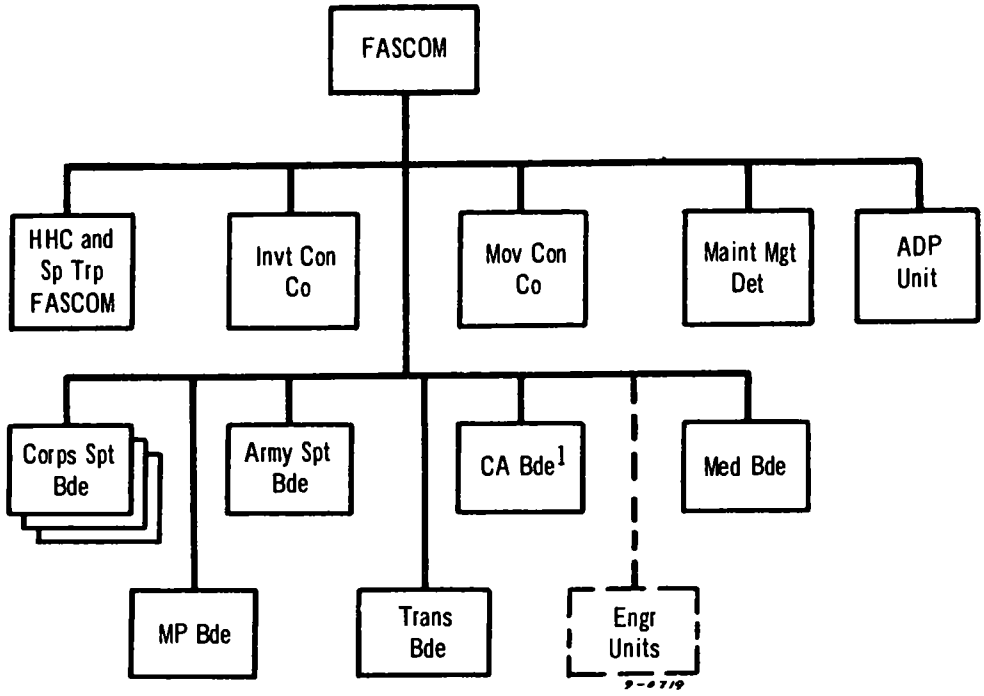
a. General. The mission of the field army support command (FASCOM) is to provide, within assigned responsibilities, combat service support to a field army (or other supported forces and agencies). The FASCOM is also responsible for rear area protection for the field army service area. Functions performed by the FASCOM include—

(1) Administration.
(2) Civil affairs.
(3) Legal services.
(4) Maintenance.
(5) Medical service.
(6) Military police.
(7) Movements.
(8) Personnel services.
(9) Services.
(10) Supply.
(11) Transportation.
(12) Comptroller services.
(13) Construction, when required, through attached units.

b. Composition. Figure 1–6 illustrates a typical FASCOM supporting a 12–division field army.

(1) *Headquarters.* Figure 1–7 illustrates the FASCOM headquarters organization, based on TOE 54–12.

(2) *Assigned forces.* Figure 1–8 provides a detailed picture of the FASCOM and the corps



[1]May be assigned or attached.

LEGEND

Attached when required.

Figure 1–6. FASCOM supporting a 12-division field army.

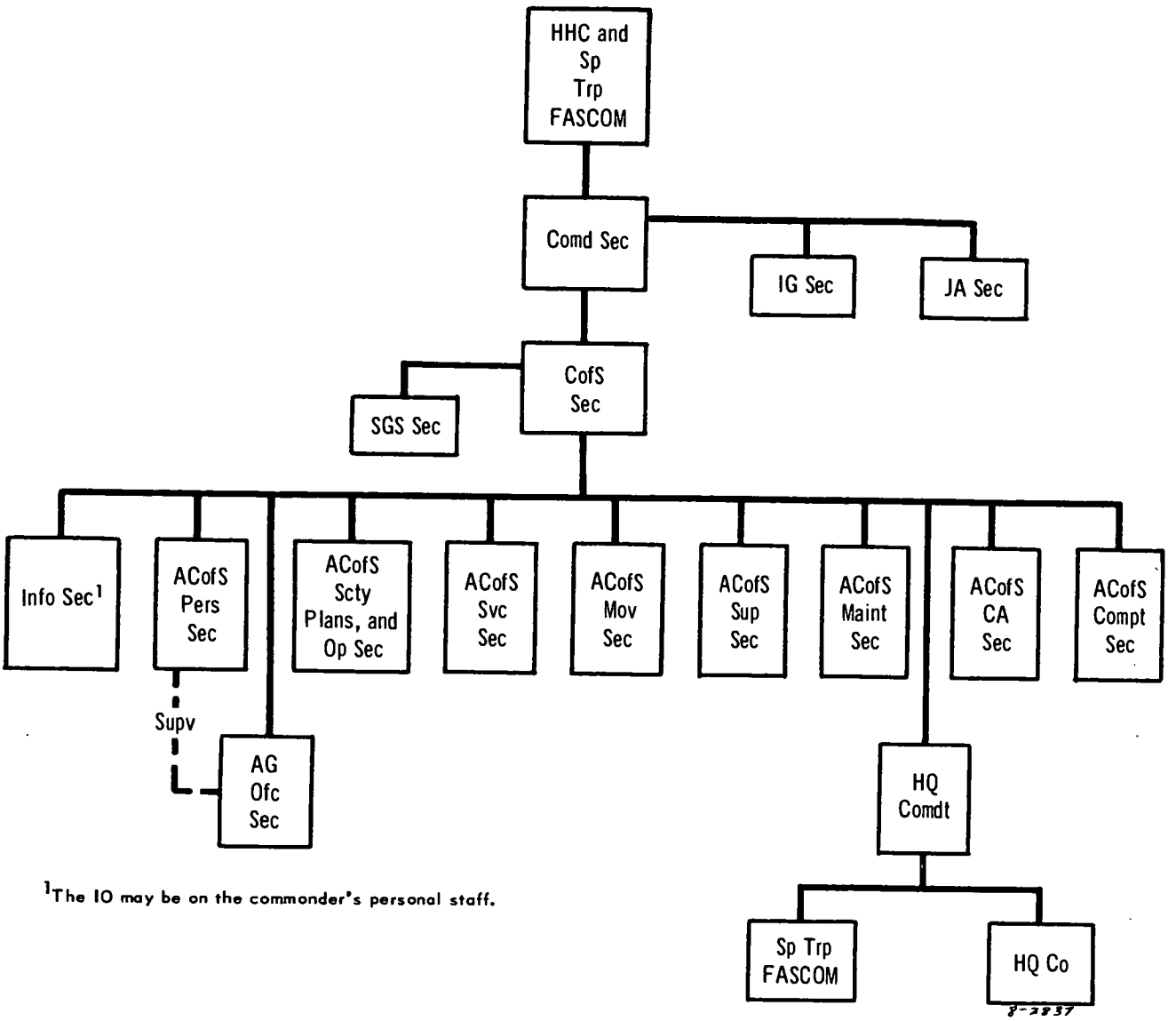
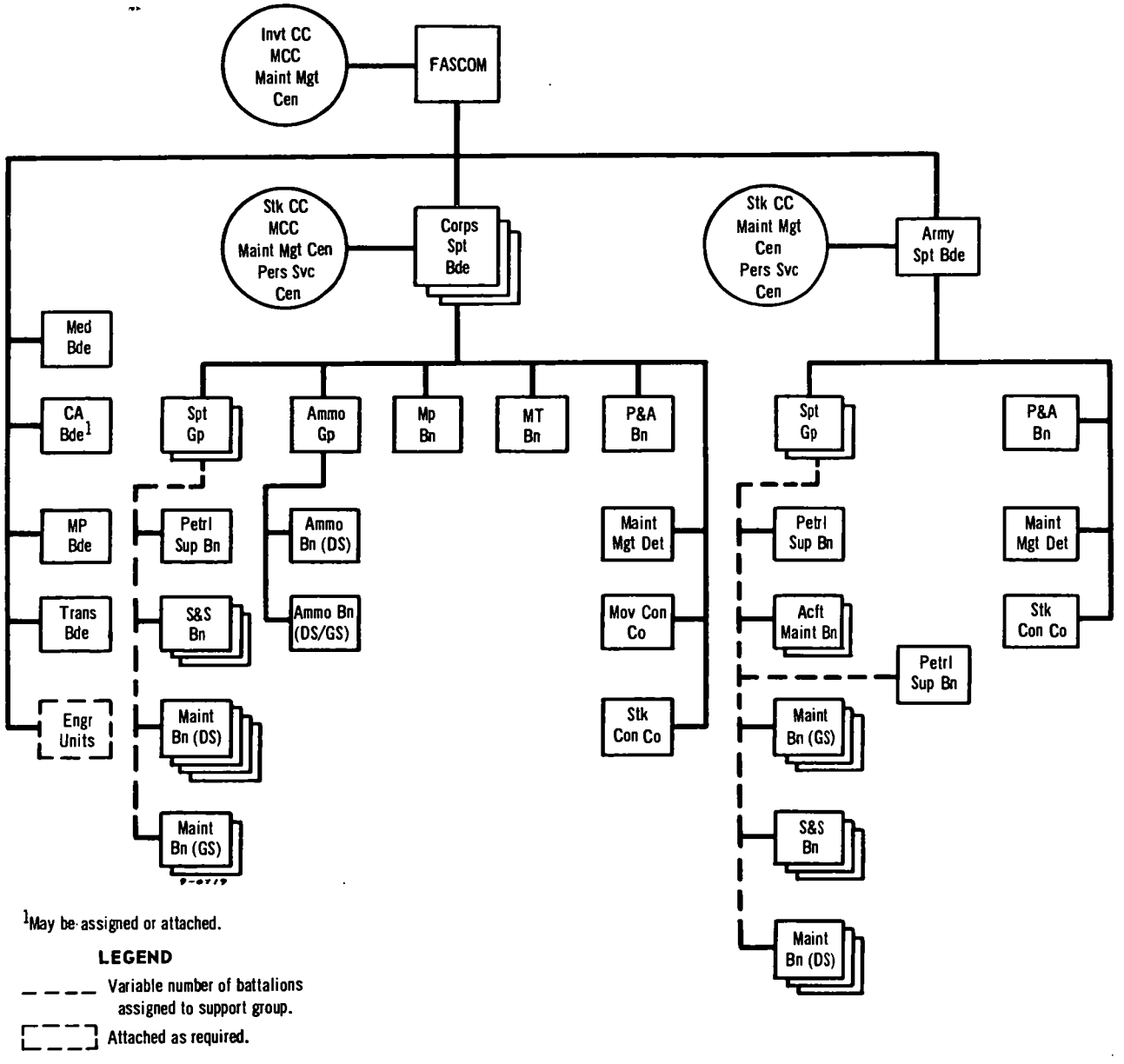


Figure 1–7. Headquarters and headquarters company and special troops, field army support command.

support brigades. Groups, battalions, and companies are further depicted in paragraph 4–2, wherein are listed the TOE strengths and assignments within a typical field army of 12 divisions. The organization of major units other than support brigades is shown (for a 12-division force) as follows:

(*a*) Personnel and administration battalion (fig. 1–9).
(*b*) Medical brigade (fig. 1–10).
(*c*) Civil affairs brigade (fig. 1–11).
(*d*) Military police brigade (fig. 1–12).
(*e*) Transportation brigade (fig. 1–13).



[1]May be assigned or attached.

LEGEND

_ _ _ _ Variable number of battalions assigned to support group.

[_ _ _] Attached as required.

Figure 1–8. The support brigades for a 12-division field army.

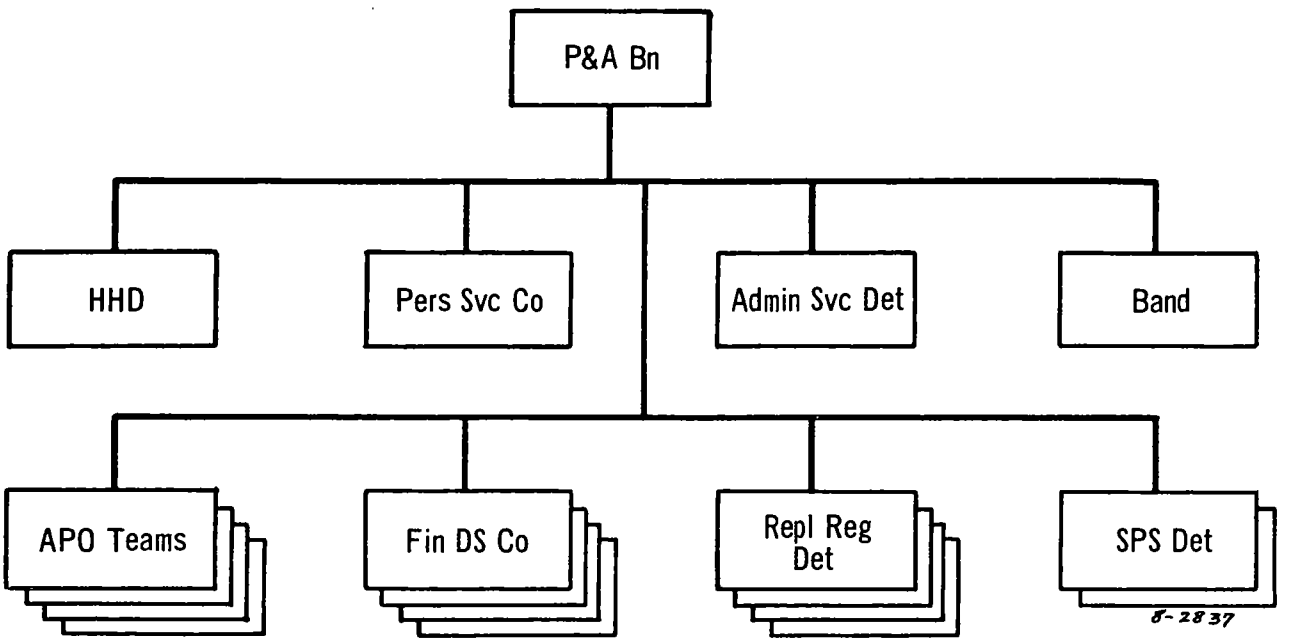


Figure 1–9. Personnel and administration battalion.

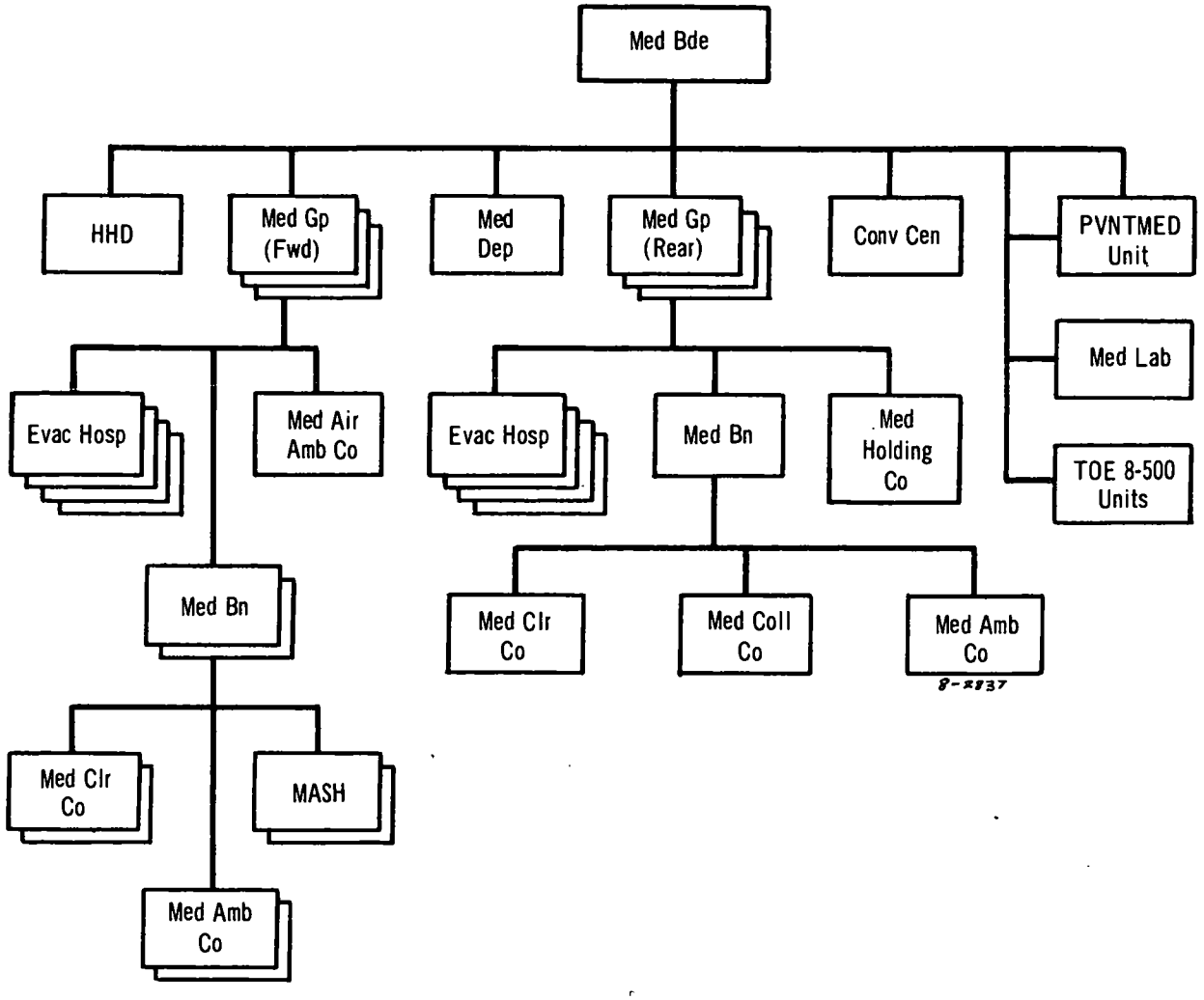


Figure 1–10. Medical brigade supporting a 12-division field army.

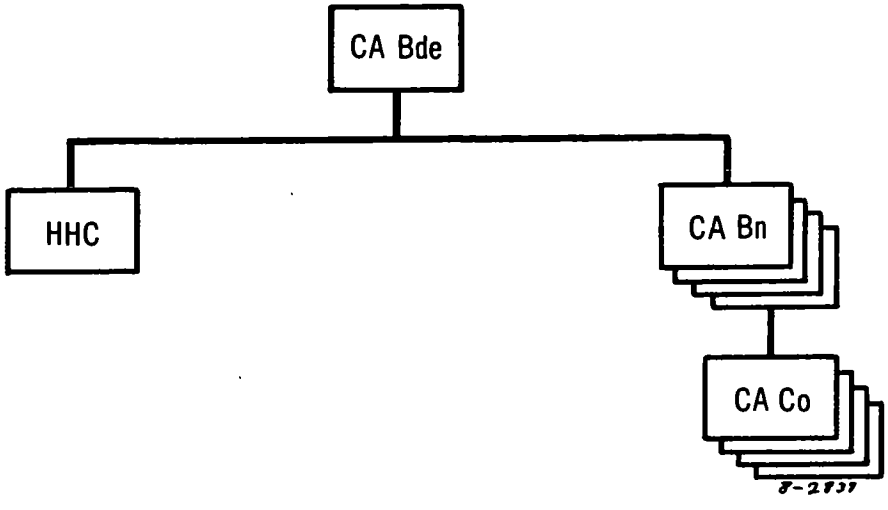
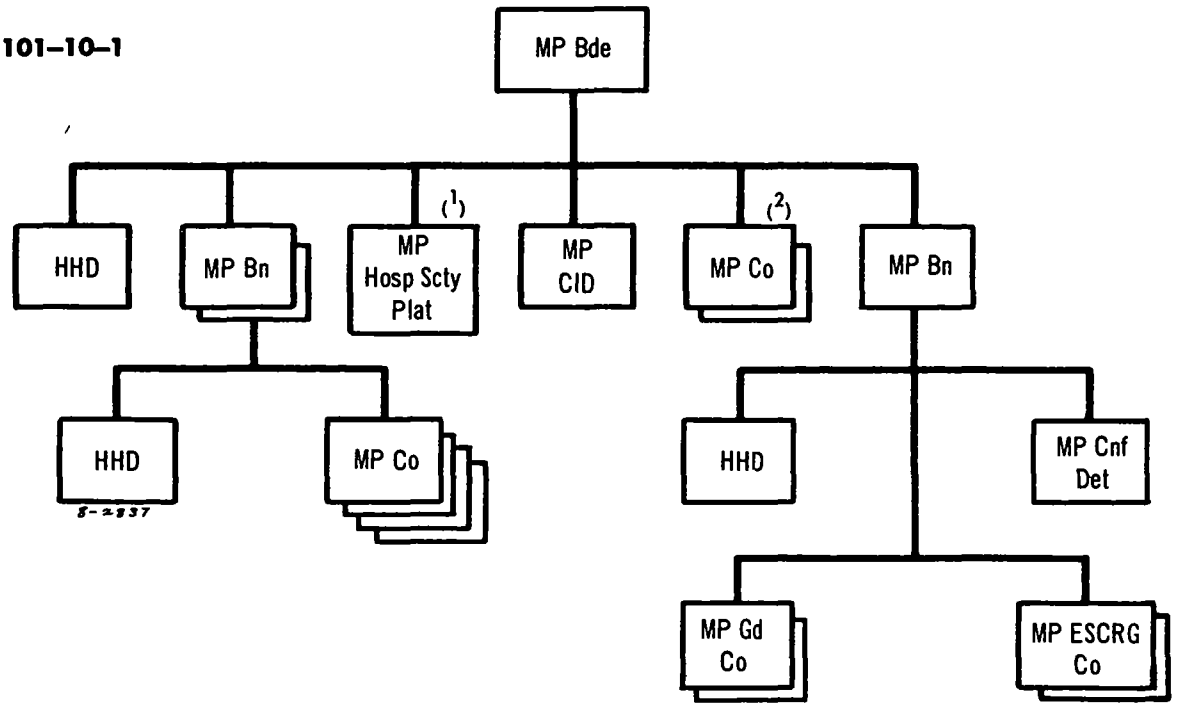


Figure 1–11. Civil affairs brigade supporting a 12-division field army.



[1] Attached to field army convalescent center.

[2] 1 attached to the field army headquarters and 1 attached to the FASCOM headquarters, with 1 plat further attached to the army support brigade headquarters.

Figure 1–12. Military police brigade supporting a 12-division field army.

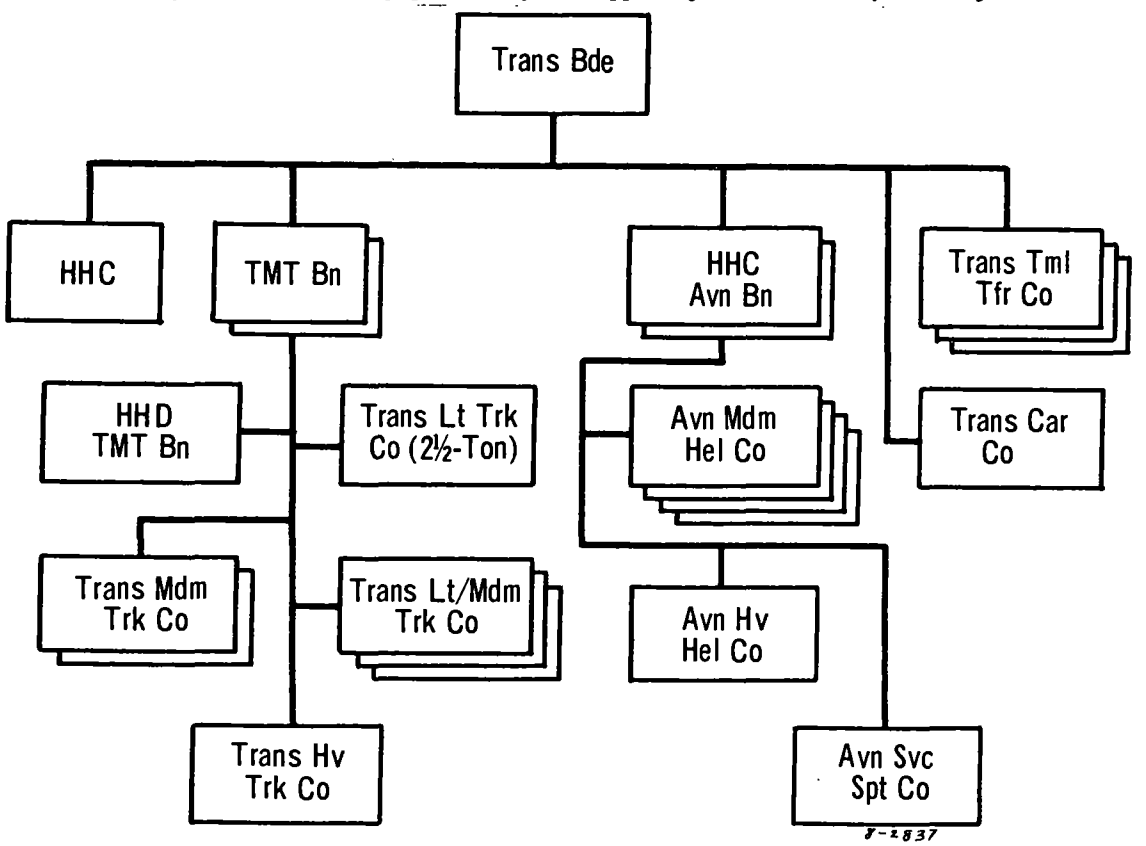


Figure 1–13. Transportation brigade supporting a 12-division field army.

Section III. DIVISIONS

1–10. Divisions

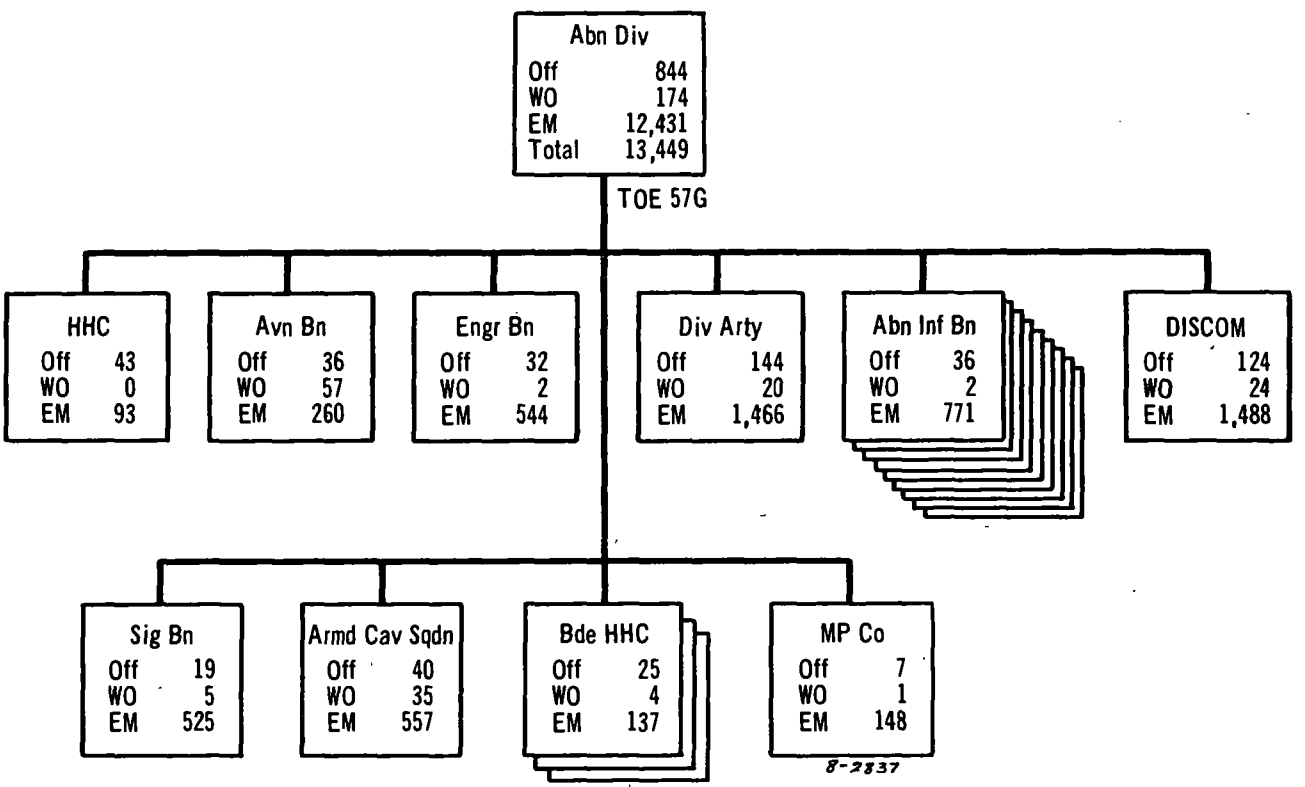
Organization charts and tables of major equipment items are illustrated for the airborne, airmobile, armored, infantry, and infantry (mechanized) divisions. Figures 1–14, 1–15, and 1–16 show organization charts for the divisions; and tables 1–1 through 1–12 show items of major equipment.

1–11. Typical Divisions

Figure 1–17 provides specific organizational structures and TOE strengths for a typical three-corps field army, with each corps composed of one armored, one infantry, and two infantry (mechanized) divisions. Each division has a base (fig. 1–16) and specific numbers of combat battalions (fig. 1–17).

1–12. TOE Data Base

Personnel strengths and equipment densities for the divisions and supporting nondivisional units were obtained from the most recent TOE prior to 1 January 1968.



NOTE: All organic units are airborne units.

Figure 1–14. Airborne division.

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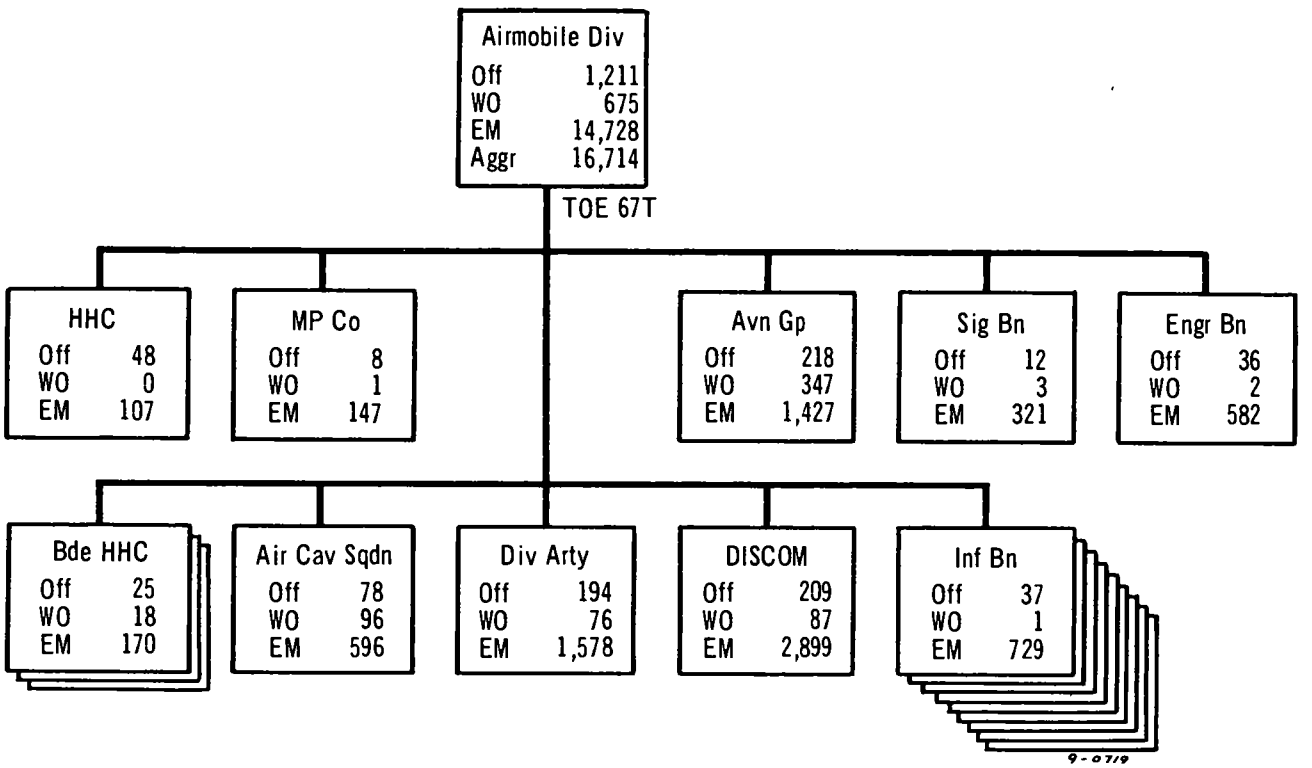
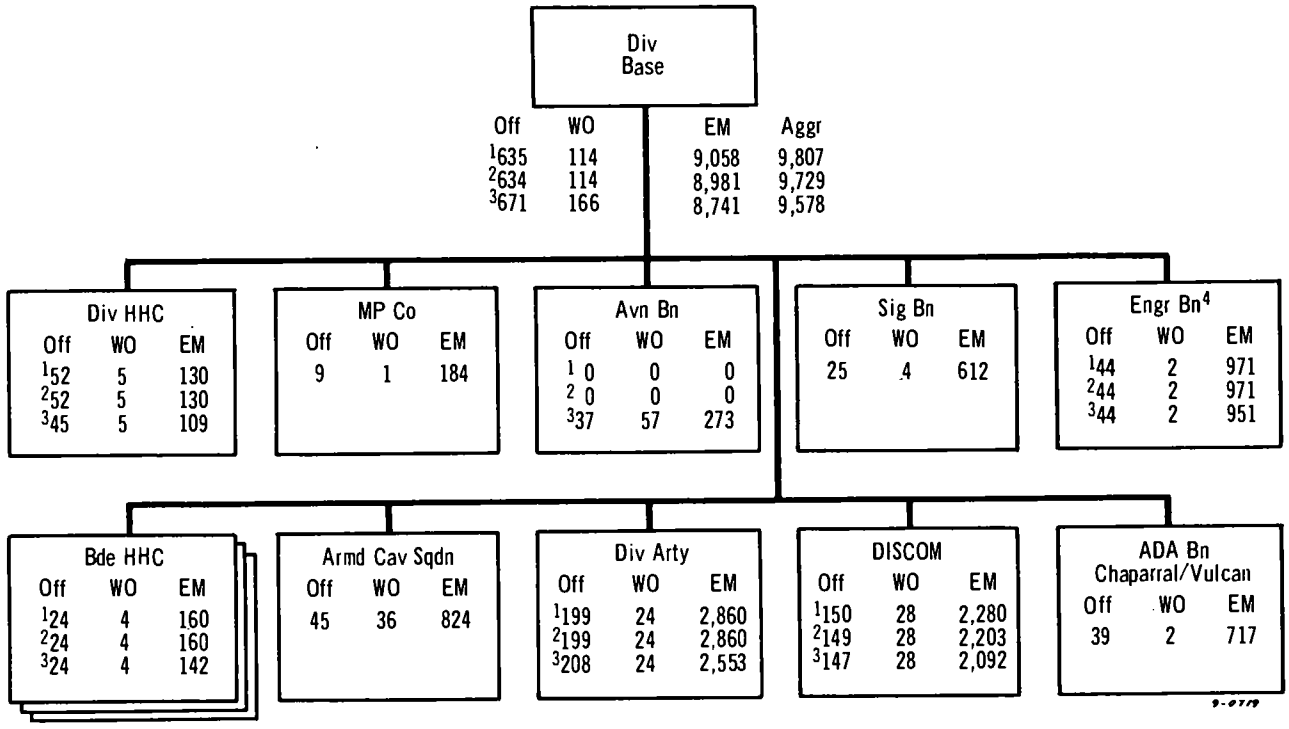
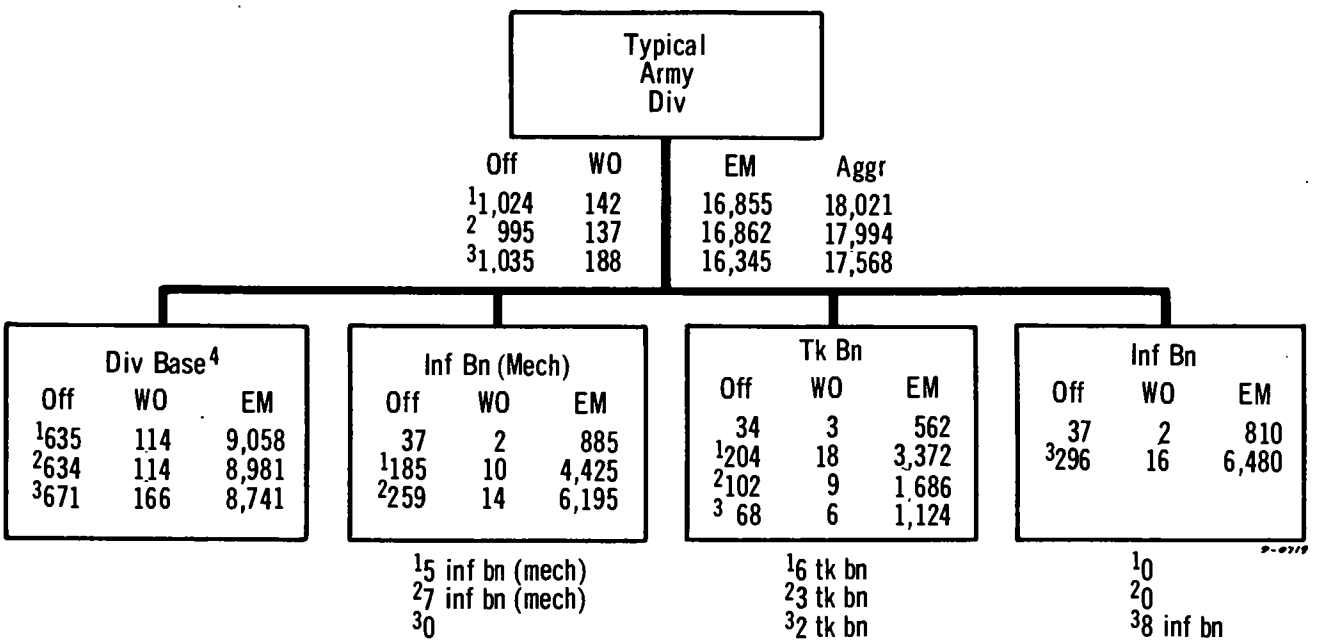


Figure 1–15. Airmobile division.



[1]Unit totals when organic to armd div.
[2]Unit totals when organic to inf div (mech).
[3]Unit totals when organic to inf div.
[4]Unit tables are for battalion when equipped with MAB bridging; with M4T6 or class 60 bridging, there are 2 more EM.

Figure 1–16. Division base.



[1]Unit totals when organic to armd div.
[2]Unit totals when organic to inf div (mech).
[3]Unit totals when organic to inf div.
[4]Unit totals include engr when equipped with MAB; with M4T6 or class 60 bridging, there are 2 EM more.

Figure 1–17. Typical army division.

Table 1–1. Airborne Division—Weapons and Missiles

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Line item number	Unit	HHC (TOE 57-4G)	Avn bn (TOE 1-55G)	Engr bn (TOE 5-25G)	Div arty (TOE 6-200G)	Inf bn (9) (each) (TOE 7-35G)	DISCOM (TOE 29-51G)	Sig bn (TOE 11-215G)	Armd cav sqdn (TOE 17-75G)	Bde HHC (3) (each) (TOE 57-42G)	MP co (TOE 19-67G)	Total div (TOE 57G)
2	A90117	Armt subsys, hel, 7.62-mm mg (M23)		25				2		6			33
3	A90154	Armt subsys, hel, 7.62-mm mg (XM27)								9			9
4	A90426	Armt subsys, hel, 7.62-mm mg/2.75-in rkt		6						7			13
5	A90460	Armt subsys, hel, 40-mm GL (M5)		6						7			13
6	A90734	Armt subsys, hel, GM lchr (M–22)								4			4
7	K57529	How, towed, 105-mm				54							54
8	L44575	Lchr, gren, 40-mm			71	60	85	2	15	59	9	13	1, 012
9	L91975	Mg, cal .50, hv, flex					7	8		11			82
10	L92386	Mg, 7.62-mm, lt, flex			17	69	24	29	2	42	2	8	389
11	M68008	Mort, 81-mm, on mount					9			6			87
12	M68282	Mort, 4.2-in., on mount					4						36
13	N96741	Pistol, cal .45, auto	28		98	142	248	57	23	115	37	43	2, 849
14	R91107	Revolver, cal .38, 2-in bbl										2	2
15	R91244	Revolver, cal .38, 4-in bbl		148		16		11		78	4		265
16	R94977	Rifle, 5.56-mm, with bipod	114	205	479	1, 470	561	1, 567	526	439	121	111	10, 323
17	R96484	Rifle, rcl, 90-mm									2		6
18	R96758	Rifle, rcl, 106-mm on mount					12			12			120

Table 1–2. Airborne Division—Vehicles and Vehicular Equipment

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Line item number	Unit	HHC (TOE 57–4G)	Avn bn (TOE 1–55G)	Engr bn (TOE 5–25G)	Div arty (TOE 6–200G)	Inf bn (9) (each) (TOE 7–35G)	DISCOM (TOE 29–51G)	Sig bn (TOE 11–215G)	Armd cav sqdn (TOE 17–75G)	Bde HHC (3) (each) (TOE 57–42G)	MP co (TOE 19–67G)	Total div (TOE 57G)
2	E02807	Chassis, tlr, genr, 2½-ton, 2-wheel, with equip						6					6
3	F43077	Crane, shovel, wheel-mtd, 7-ton, ½-cu yd, gas, with boom crane, 24-ft, block and tackle, 9-ton						3					3
4	G02478	Detecting set, mine, trk-mtd			1								1
5	J41041	Genr set, gas eng, tlr-mtd, PU–253/U		1									1
6	J41178	Genr set, gas eng, tlr-mtd, PU–290/MR						13					13
7	J41589	Genr set, gas eng, tlr-mtd, PU–322/G							9		1		12
8	J74920	Grader, road, motorized, diesel, 10,000-lb			4								4
9	L76351	Loader, scoop-type, diesel, 4-wheel, 1½-cu yd			4								4
10	L85420	Lub and svc unit, power-op, tlr-mtd, 15 cfm			1								1
11	P11866	Pneumatic pool and compressor outfit, 250 cfm, tlr-mtd			2								2
12	S72024	Stlr, stake, 12-ton, 4-wheel, with equip						3					3
13	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip						4					4
14	T10138	Shop equip, contact maint, trk-mtd			1			4					5
15	T13152	Shop equip, org rep, lt, trk-mtd			1								1
16	V19950	TK unit, liquid-dispensing, tlr-mtd							1				1
17	W80378	Trac, full-tracked, low-speed, diesel, lt DBP			6								6
18	W89557	Trac, wheeled, whs, gas, 4,000-lb						4					4
19	W94030	Tlr, ammo, 1½-ton, 2-wheel with equip								6			6
20	W94441	Tlr, basic util, 2½-ton, 2-wheel with equip			9								9
21	W95400	Tlr, cgo, ¼-ton, 2-wheel, with equip	12	7	23	36	29	38	59	37	9	17	517

22	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	12	26	24	93	14	94	26	30	10	2	463
23	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip		2	5	16	4	18	2				79
24	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-wheel, with equip	1	2	4	13	4	11	2	4	1		76
25	X38639	Trk, amb, ¼-ton, 4x4, with equip	2	1	1	4	6	36		6			104
26	X39735	Trk, cgo, ¾-ton, 4x4, with equip	13	21		68	13	94	60	28	8	2	427
27	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip		8	52	93	1	16		8	2		192
28	X40009	Trk, cgo, 2½-ton, 6x6, with equip	1	3	1	16	6	35	2	2	1		117
29	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip		12	6	17	2	2	2	13			70
30	X40283	Trk, cgo, 2½-ton, 6x6, extra LWB, with equip						1					1
31	X43434	Trk, dump, 2½-ton, 6x6, WWN, with equip			27								27
32	X48846	Trk, lift, fork, airmbl, 4,000-lb						7					7
33	X49051	Trk, lift, diesel, 10,000-lb						3					3
34	X55627	Trk, platform, util, ½-ton, 4x4, with equip			28	24	41	3	3		4		439
35	X57271	Trk, tk, fuel svc, 2½-top, 6x6, with equip								2			2
36	X59326	Trk, trac, 5-ton, 6x6, with equip						7					7
37	X60833	Trk, util, ¼-ton 4x4, with equip	18	9	27	141	35	52	59	81	12	30	768
38	X61244	Trk, util, ¼-ton, 4x4, carr, 106-mm rifle, with equip								12			12
39	X63025	Trk, wkr, crane, 2½-ton, 6x6, WWN with equip				3		2		1			6
40	X63162	Trk, wkr, 2½-ton, 6x6, WWN, with equip			1				1				2
41	Y35212	Water purification equip set, tlr-mtd, diatomite filter, 600 GPH			5								5

Table 1-3. Airmobile Division—Weapons and Missiles

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Line item number	Unit	HHC (TOE 67-2T)	MP co (TOE 19-87T)	Avn gp (TOE 1-100T)	Sig bn (TOE 11-205T)	Engr bn (TOE 5-215T)	Bde HHC (3) (each) (TOE 67-42T)	Cav sqdn (TOE 17-95T)	Div arty (TOE 6-700T)	DISCOM (TOE 29-41T)	Inf bn (9) (each) (TOE 7-55T)	Total div (TOE 67T)
2	A90117	Armt subsys, hel, 7.62-mm mg (M23)			124			5	20		5		164
3	A90122	Armt subsys, hel, 7.62-mm mg (M24)			48								48
4	A90154	Armt subsys, hel, 7.62-mm (XM-27)			19			8	30	16	4		93
5	A90460	Armt subsys, hel, 40-mm GL (M5)			30				38	7			75
6	A90597	Armt subsys, hel, 2.75-in. RL (XM3)								36			36
7	A90734	Armt subsys, hel, GM lchr M-22)								12			12
8	H68063	Flamethrower, portable						1				9	75
9	K57392	How, lt, towed, 105-mm								54			54
10	L44575	Lchr, gren, 40-mm		13	70	31	32	15	215	42	109	86	1, 245
11	L45260	Lchr, rkt, 3.5-in			2	1					35		38
12	L91975	Mg, cal .50, hv, flex									4		4
13	L92386	Mg, 7.62-mm, lt, flex	2	8	50	2	38	6	37	106	80	20	501
14	M68008	Mort, 81-mm, on mount							3			13	107
15	N96741	Pistol, cal .45, auto	43	43	103	39	83	42	307	180	193	235	2, 997
16	R91107	Revolver, cal .38, 2-in. bbl		2									2
17	R91244	Revolver, cal .38, 4-in. bbl			807			32	193	154	118		1, 368
18	R94977	Rifle, 5.56-mm, with bipod	112	111	1, 079	297	536	135	270	1, 512	2, 879	532	11, 457
19	R96484	Rifle, rcl, 90-mm		4								18	148
20	R96758	Rifle, rcl, 106-mm, on mount							6			8	70
21	X55627	Carr, lt wpn, ½-ton, 4x4, with equip		3							49		52

Table 1–4. Airmobile Division—Vehicles and Vehicular Equipment

1	1 Line item number	2 Unit	3 HHC (TOE 67-2T)	4 MP co (TOE 19-87T)	5 Avn gp (TOE 1-100T)	6 Sig bn (TOE 11-205T)	7 Engr bn (TOE 5-215T)	8 Bde HHC (each) (TOE 67-42T)	9 Cav sqdn (TOE 17-95T)	10 Div arty (TOE 6-700T)	11 DISCOM (TOE 29-41T)	12 Inf bn (each) (TOE 7-55T)	13 Total div (TOE 67T)
2	E02807	Chassis, tlr, genr, 2½-ton, 2-wheel	2								5		7
3	F39172	Crane, wheel-mtd, 3-ton					2				9		11
4	G02478	Detecting set, mine, trk-mtd					1						1
5	H56391	Fftg equip set, trk-mtd, AACFT crash			1								1
6	J49055	Genr set, gas eng, 7.5-kw, 2-wheel mtd							3				3
7	J74886	Gr, rd, mtr, sectionalized					6						6
8	J75239	Gr/scraper					4						4
9	S11684	Roller, pneumatic					2						2
10	S12575	Roller, towed, sheepsfoot, 2 drums					2						2
11	S55393	Util veh, 2-wheel, Cushman	4	9	26		4	3		6	14	2	88
12	S55400	Util veh, 3-wheel, Cushman			2								2
13	S74490	Stlr, van, expansible, 6-ton, 4-wheel with equip									4		4
14	S74024	Stlr, stake, 12-ton, 4-wheel, with equip									1		1
15	T10138	Shop equip, contact maint, trk-mtd					3				1		4
16	W76200	Trac, wheeled, indiv					4						4
17	W76268	Trac, full-tracked, low-speed diesel					4						4
18	W76302	Trac, with backhoe and front loader, ½-cu yd					3						3
19	W76336	Trac, full-tracked, with blade and rear power-takeoff hel, trans					6						6
20	W89557	Trac, wheel whs, gas, 4,000-lb									2		2
21	W93961	Tlr, trans, adj bed, with conveyor									43		43
22	W94441	Tlr, basic util, 2½-ton, 2-wheel with equip					2						2
23	W95400	Tlr, amph cgo, ¼-ton, 2-wheel, with equip	16	13	60	56	33	16	29	90	113	9	530
24	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	10	4	117	6	15	7	33	34	93	2	349
25	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip	2		31		3		6	7	27		76
26	W96701	Tlr, ramp, 6-ton					9						9
27	W97866	Tlr, oxy svc, 3-wheel			1								1
28	W98270	Tlr, platform whs, 6,000-lb			63						6		69
29	W98619	Tlr, 4-wheel, M-274 model								4			4
30	W98825	Tlr, tk, water, 1½-ton, 2-wheel	1		4	1	1		5	9	5		26
31	X23190	Trans, engr const equip, 12-ton					8						8
32	X38639	Trk, amb, ¼-ton, 4x4, with equip			3		1		2	1	12		19

Table 1-4. Airmobile Division—Vehicles and Vehicular Equipment—Continued

1	1 Line item number	2 Unit	3 HHC (TOE 67-2T)	4 MP co (TOE 19-87T)	5 Avn gp (TOE 1-100T)	6 Sig bn (TOE 11-205T)	7 Engr bn (TOE 5-215T)	8 Bde HHC (each) (TOE 67-42T)	9 Cav sqdn (TOE 17-95T)	10 Div arty (TOE 6-700T)	11 DISCOM (TOE 29-41T)	12 Inf bn (each) (TOE 7-55T)	13 Total div (TOE 67T)
33	X39735	Trk, cgo, ¾-ton, 4x4, with equip	12	4	117	----	13	2	3	34	70	----	259
34	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip	----	----	5	7	----	6	33	36	30	2	145
35	X40009	Trk, cgo, 2½-ton, 6x6, with equip	2	----	31	----	----	----	----	16	41	----	90
36	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	1	----	7	----	----	----	11	----	10	----	29
37	X40420	Trk, cgo, 2½-ton, 6x6, extra LWB, WWN, with equip	----	----	----	----	1	----	----	----	----	----	1
38	X43228	Trk, dump, ¾-ton, 4x4, 1 cu yd with equip	----	----	----	----	42	----	----	----	----	----	42
39	X43297	Trk, dump, 2½-ton, 6x6, with equip	----	----	----	----	15	----	----	----	----	----	15
40	X49051	Trk, lift, fork, diesel, 10,000-lb	----	----	----	----	----	----	----	----	1	----	1
41	X55627	Trk, platform, util, ½-ton, 4x4, with equip	----	----	24	----	----	6	10	26	28	19	258
42	X57408	Trk, tk, fuel svc, 2½-ton, 6x6, WWN, with equip	----	----	14	----	----	1	4	4	5	----	30
43	X59326	Trk, trac, 5-ton, 6x6, with equip	----	----	----	----	----	----	----	----	1	----	1
44	X60833	Trk, util, ¼-ton, 4x4, with equip	20	26	92	75	33	17	47	90	113	5	587
45	X61244	Trk, util, ¼-ton, 4x4, carr, 106-mm rifle, with equip	----	----	----	----	----	----	6	----	----	8	70
46	X63094	Trk, ¾-ton, 4x4 with wkr, kit, mtd	----	----	----	----	1	----	----	----	5	----	6
47	X63162	Trk, wkr, 2½-ton, 6x6, WWN, with equip	----	----	----	----	----	----	1	----	2	----	3
48	Y48255	Welding shop, cgo, tlr-mtd 300-amp	----	----	----	----	1	----	----	----	----	----	1

Table 1–5. Summary of Divisions' Equipment, Weapons, and Missiles

1	1	2	Division Base			Typical Division		
			5	4	5	6	7	8
	Line item number	Unit	Armd (TOE 17G)	Inf (mech) (TOE 57G)	Inf (TOE 7G)	Armd div base 6 tk bn (TOE 17-35G) 5 inf bn (mech) (TOE 7-45G)	Inf div (mech) base 3 tk bn (TOE 17-35G) 7 inf bn (mech) (TOE 7-45G)	Inf div base 2 tk bn (TOE 17-35G) 8 inf bn (TOE 7-15G)
2	A90117	Armt subsys, hel, 7.62-mm mg (M23)	6	6	31	6	6	31
3	A90154	Armt subsys, hel, 7.62-mm mg (XM27)	9	9	9	9	9	9
4	A90426	Armt subsys, hel, 7.62-mm mg/2.75-in RL			6			6
5	A90460	Armt subsys, hel, 40-mm GL (M5)	7	7	13	7	7	13
6	A9073	Armt subsys, hel, GM lchr (M–22)	4	4	4	4	4	4
7	D10723	Carr, 81-mm mort, full-tracked				45	63	
8	D10740	Carr, 107-mm mort, SP	9	9	9	53	49	17
9	D11248	Carr, cgo, t acked, 6-ton	58	58	4	58	58	4
10	D11401	Carr, comd and recon, armd	62	62	50	186	187	68
11	D11538	Carr, CP, lt tracked	63	63	8	140	133	22
12	D12086	Carr, pers, full-tracked, armd	87	87	31	410	469	57
13	E56577	Cbt, engr veh, full-tracked	8	8	4	8	8	4
14	J93997	Guidance and launching sta, with equip (ENTAC)				15	21	24
15	K56981	How, hv, SP, 8-in	4	4	4	4	4	4
16	K57529	How, towed, 105-mm			54			54
17	K57666	How, mdm, SP, 155-mm	72	72		72	72	
18	K57803	How, mdm, towed, 155-mm			18			18
19	L44575	Lchr, gren, 40-mm	478	478	382	1, 062	1, 193	1, 100
20	L45534	Lchr, rkt, 762-mm, trk-mtd, with equip (HJ)	4	4	4	4	4	4
21	L91975	Mg, cal .50, hv flex	57	57	57	289	263	205
22	L92386	Mg, 7.62-mm, lt flex	323	324	315	592	679	523
23	M68008	Mort, 81-mm, on mount				45	63	72
24	M68282	Mort, 4.2-in on mount	9	9	9	53	49	49
25	N96741	Pistol, cal .45, auto	1, 133	1, 131	1, 006	4, 351	3, 892	3, 564
26	R50543	Recov veh, full-tracked, lt, armd	16	16	10	41	51	10
27	R50680	Recov veh, full-tracked, mdm, armd	7	7	5	37	22	15
28	R91107	Revolver, cal .38, 2-in. bbl	2	2	2	2	2	2
29	R91244	Revolver cal .38, 4-in. bbl	122	121	252	122	121	252
30	R95114	Rifle, 7.62-mm	8, 342 (8, 344)	8, 233 (8, 235)	8, 073 (8, 075)	13, 068 (13, 070)	13, 359 (13, 361)	13, 057 (13, 059)
31	R95251	Rifle, 7.62-mm auto, with bipod	293	299	293	563	677	741
32	R96484	Rifle, rcl, 90-mm	15	15	15	105	141	159
33	R96758	Rifle, rcl, 106-mm, on mount				30	42	64
34	U56346	Smg, cal .45	44	44	38	802	468	274
35	V12826	Tk, cbt, full-tracked, 76-mm gun	27	27	27	27	27	27
36	V13100	Tk, cbt, full-tracked, 105-mm gun				324	162	108
37	J96694	Gun, ADA, SP, 20-mm (XM163)	32	32	32	32	32	32
38	Z32321	GM sys, AD, Chaparral XM48	32	32	32	32	32	32

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Table 1–6. Summary of Divisions' Equipment, Vehicles, and Vehicular Equipment

1	1	2	Division Base			Typical Division		
			3	4	5	6	7	8
1	Line item number	Unit	Armd (TOE 17G)	Inf (mech) (TOE 37G)	Inf (TOE 7G)	Armd div base 6 tk bn (TOE 17-35G) 5 inf bn (mech) (TOE 7-45G)	Inf div (mech) base 3 tk bn (TOE 17-35G) 7 inf bn (mech) (TOE 7-45G)	Inf div base 2 tk bn (TOE 17-35G) 8 inf bn (TOE 7-15G)
2	E02670	Chassis tlr, GP, 3½-ton, 2-wheel with equip	1	1	1	1	1	1
3	E02807	Chassis tlr, genr, 2½-ton, 2-wheel with equip	7	7	7	7	7	7
4	F39241	Crane, wheel-mtd, 5-ton, ⅝-cu yd diesel, 4x4, rough terrain, air-trans	4	----------	4	4	----------	4
5	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	3	3	3	3	3	3
6	H56391	Fftg equip set, trk-mtd, AACFT, crash	1	1	----------	1	1	----------
7	J35561	Genr set, diesel eng, tlr-mtd, PU 407/M	2	2	2	2	2	2
8	J35698	Genr set, diesel eng, trk-mtd, PU 408/M	2	2	2	2	2	2
9	J41178	Genr set, gas eng, tlr-mtd, PU 290/MR	22	21	19	22	21	19
10	J41315	Genr set, gas eng, tlr-mtd, PU 294/G	4	4	3	4	4	3
11	J41589	Genr set, gas eng, tlr-mtd, PU 322/G	1	1	1	1	1	1
12	J41931	Genr set, gas eng, tlr-mtd, PU 456/G	----------	----------	1	----------	----------	1
13	J74852	Grader, rd, motorized, diesel, hv, 6x4, front-wheel steer	4	4	4	4	4	4
14	K90188	Inst rep shop, trk-mtd, 2½-ton, 6x6, with equip	18	18	18	18	18	18
15	L76625	Loader, scoop, diesel, 4-wheel, 2½-cu yd	13	13	13	13	13	13
16	L85146	Lub and svc unit, power-op, tlr-mtd	1	1	1	1	1	1
17	P11866	Pneumatic, tool and compressor outfit, 250-cfm, tlr-mtd	5(7)	5(7)	5(7)	5(7)	5(7)	5(7)
18	S70243	Stlr, low-bed, wkr, 12-ton, 4-wheel, 40-ft, with equip	1	1	1	1	1	1
19	S70517	Stlr, low-bed, 25-ton, 4-wheel, with equip	10	10	14	10	10	14
20	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip	0(1)	0(1)	0(1)	0(1)	0(1)	0(1)
21	S72024	Stlr, stake, 12-ton, 4-wheel, with equip	38	37	38	38	37	38
22	S72983	Stlr, tk, fuel svc, 5,000-gal, 12-ton	20	20	10	20	20	10
23	S73394	Stlr, tk, trans, 50-ton, 8-wheel, with equip	6	6	2	6	6	2
24	S73805	Stlr, van, 6-ton, 4-wheel, with equip	12	12	12	12	12	12
25	S74079	Stlr, van, cgo, 12-ton, 4-wheel, with equip	2	2	2	2	2	2
26	S74490	Stlr, van expansible, 6-ton, 4-wheel, with equip	4	4	4	4	4	4
27	T10138	Shop equip, contact maint, trk-mtd	11	2	2	11	2	2
28	T10275	Shop equip, elec rep, stlr-mtd	1	1	1	1	1	1
29	T10412	Shop equip, elct rep, stlr-mtd	1	1	1	1	1	1
30	T13152	Shop equip, org rep, lt, trk-mtd	2	2	2	2	2	2
31	T21235	Shop set, acft maint, stlr-mtd, A–1	1	1	1	1	1	1
32	T21372	Shop set, acft maint, stlr-mtd, A–2	1	1	1	1	1	1
33	V09730	Tagline, crane and shovel, ¾-ton, 1-cu yd bucket	1	1	1	1	1	1
34	V19950	Tk, unit liq-dispensing, tlr-mtd	14	14	10	64	57	36
35	W76816	Trac, full-tracked, low-speed, diesel, Hv DBP with bulldozer	8	8	12	8	8	12

36	W94030	Tlr, ammo, 1½-ton, 2-wheel, with equip	117	117	78	137	145	78
37	W94441	Tlr, basic util, 2½-ton, 2-wheel, with equip	2(10)	2(10)	38(46)	2(10)	2(10)	38(46)
38	W95263	Tlr, cable reel, 3½-ton, 2-wheel, with equip	2	2	2	2	2	2
39	W95400	Tlr, cgo, ¼-ton, 2-wheel, with equip	388	378	423	633	640	765
40	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	319	318	353	403	414	649
41	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip	528(522)	525(519)	430(424)	724(718)	686(680)	600(594)
42	W96907	Tlr, flat-bed, 10-ton, 4-wheel, with equip	1	1	1	1	1	1
43	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-wheel, with equip	68	68	67	112	108	107
44	X38639	Trk, amb, ¼-ton, 4x4, with equip	8	8	8	41	41	62
45	X38776	Trk, amb, ¼-ton, 4x4, with equip	56	56	57	56	56	57
46	X38951	Trk, amb, 1¼-ton, 4x4, with equip	1	1	1	1	1	1
47	X39735	Trk, cgo, ¾-ton, 4x4, with equip	349	348	366	411	424	674
48	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip	80	80	86	141	133	114
49	X39883	Trk, cgo, 1¼-ton, 4x4, with equip	47	47	47	47	47	47
50	X40009	Trk, cgo, 2½-ton, 6x6, with equip	382(390)	367(375)	353(361)	443(451)	420(428)	437(445)
51	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	175(171)	184(180)	297(293)	279(275)	254(250)	397(393)
52	X40283	Trk, cgo, 2½-ton, 6x6, extra LWB, with equip	3	3	3	3	3	3
53	X40831	Trk, cgo, 5-ton, 6x6, LWB, with equip	67	67	19	175	148	45
54	X40968	Trk, cgo, 5-ton, 6x6, LWB, WWN, with equip	84	84	59	166	158	89
55	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip	22	22	58	22	22	58
56	X48846	Trk, lift, fork, airmbl, 4,000-lb	3	3	3	3	3	3
57	X48914	Trk, lift, fork, diesel, 6,000-lb	1	1	1	1	1	1
58	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip	2(50)	2(50)	2(50)	2(50)	2(50)	2(50)
59	X57271	Trk, tk, fuel svc, 2½-ton, 6x6, with equip	22	22	28	22	25	30
60	X57408	Trk, tk, fuel svc, 2½-ton, 6x6, WWN, with equip	2	2	2	2	2	2
61	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip	1	1	1	1	1	1
62	X59326	Trk, trac, 5-ton, 6x6, with equip	62	56	52	62	56	52
63	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip	1	1	1	1	1	1
64	X59600	Trk, trac, 10-ton, 6x6, with equip, high 5th wheel	6	6	2	6	6	2
65	X59874	Trk, trac, 10-ton, 6x6, with equip, low 5th wheel	11	11	15	11	11	15
66	X60696	Trk, trac wkr, 5-ton, 6x6, WWN, with equip	1	1	1	1	1	1
67	X60833	Trk, util, ¼-ton, 4x4, with equip	505	505	541	864	824	969
68	X61244	Trk, util, ¼-ton, 4x4, carr, 106-mm rifle, with equip				30	6	64
69	X61929	Trk, van, expansible, 2½-ton, 6x6, with equip	4	4	4	4	4	4
70	X62237	Trk, van, expansible, 5-ton, 6x6, with equip	2	2	2	2	2	2
71	X62340	Trk, van, shop, 2½-ton, 6x6, with equip	52	48	66	62	62	74
72	X62477	Trk, van, shop, 2½-ton, 6x6, WWN, with equip	4	4	4	4	4	4
73	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip	26	30	27	43	43	39
74	Y35486	Water purification equip set, trk-mtd, 1,500 gal/hr	5	5	5	5	5	5
75	Y48255	Welding shop, cgo, tlr-mtd, 300-amp	2	2	2	2	2	2

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Table 1-7. Armored Division Base—Weapons and Missiles

1	1	2	3	4	5	6	7	8	9	10	11	12
1	Line item number	Unit	HHC (TOE 17-4G)	MP co (TOE 19-27G)	Sig bn (TOE 11-35G)	Engr bn (TOE 5-145G)	Bde HHC (3) (each) (TOE 17-42G)	Armd cav sqdn (TOE 17-105G)	Div arty (TOE 6-300G)	ADA bn C/V, SP (TOE 44-325G)	DISCOM (TOE 29-21G)	Total div base (TOE 17G)
2	A90117	Armt, subsys, hel, 7.62-mm, mg(M23)						6				6
3	A90154	Armt, subsys, hel, 7.62-mm, mg(XM27)						9				9
4	A90460	Armt, subsys, hel, 40-mm GL (M5)						7				7
5	A90734	Armt, subsys, hel, GM lchr (M-22)						4				4
6	D10740	Carr, 107-mm mort, SP						9				9
7	D11048	Carr, cgo, tracked, 6-ton							58			58
8	D11401	Carr, comd and recon, armd	3				3	50				62
9	D11538	Carr, CP, lt-tracked	2				6	6	37			63
10	D12086	Carr, pers, full-tracked, armd				44	4	25		6		87
11	E56577	CEV, full-tracked				8						8
12	K56981	How, hv, SP, 8-in							4			4
13	K57666	How, mdm, SP, 155-mm							72			72
14	L44575	Lchr, gren, 40-mm		16	16	89	11	108	216			478
15	L45534	Lchr, rkt, 762-mm, trk-mtd (HJ)							4			4
16	L91975	Mg, cal .50, hv, flex	2		10		3	32			4	57
17	L92386	Mg, 7.62-mm, lt, flex		9	3	15	5	13	181	20	67	323
18	M68282	Mort, 4.2-in, on mount						9				9
19	N96741	Pistol, cal .45, auto	32	49	32	161	41	284	354	26	72	1, 133
20	R50543	Recov veh, full-tracked, lt armd					1	5	4	4		16
21	R50680	Recov veh, full-tracked, mdm armd				2			1		4	7
22	R91107	Revolver, cal .38, 2-in. bbl		2								2
23	R91244	Revolver, cal .38, 4-in, bbl	14				4	68	16		12	122
24	R95114	Rifle, 7.62-mm	147	109	609	752(754)	132	527	2, 721	683	2, 398	8, 342(8, 344)
25	R95251	Rifle, 7.62-mm auto, with bipod		34		103	6	26		108	4	293
26	R96484	Rifle, rcl, 90-mm		9			2					15
27	U56346	Smg, cal .45					2	38				44
28	V12826	Tk, cbt, full-tracked. 76-mm gun						27				27
29	J96694	Gun, ADA, SP, 20-mm (XM163)								32		32
30	Z32321	GM Sys, AD, Chaparral XM48								32		32

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Table 1-8. Armored Division Base—Vehicles and Vehicular Equipment

1	1	2	3	4	5	6	7	8	9	10	11	12
1	Line item number	Unit	HHC (TOE 17-4G)	MP co (TOE 19-27G)	Sig bn (TOE 11-35G)	Engr bn (TOE 5-145G)	Bde HHC (3) (each) (TOE 17-42G)	Armd cav sqdn (TOE 17-105G)	Div arty (TOE 6-300G)	ADA bn C/V, SP (TOE 44-325G)	DISCOM (TOE 29-21G)	Total div base (TOE 17G)
2	EO2670	Chassis, tlr, GP, 3½-ton, 2 wheel with equip									1	1
3	EO2807	Chassis, tlr, genr, 2½-ton, 2-wheel, with equip								2	5	7
4	F39241	Crane, wheel-mtd, 5-ton, ⅜-cu yd, diesel, air-trans									4	4
5	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain				3						3
6	H56391	Fftg equip set, trk-mtd, AACFT, crash									1	1
7	J35561	Genr set, diesel eng, tlr-mtd, PU-407/M			2							2
8	J35698	Genr set, diesel eng, trk-mtd, PU-408/M			2							2
9	J41178	Genr set, gas eng, tlr-mtd, PU-290/MR			3						19	22
10	J41315	Genr set, gas eng, tlr-mtd, PU-294/G			2					1	1	4
11	J41589	Genr set, gas eng, tlr-mtd, PU-322/G			1							1
12	J74852	Grader, rd, motorized, diesel, hv, 6x4, front-wheel steer				4						4
13	K90188	Inst rep shop, trk-mtd, 2½-ton, 6x6, with equip			3						15	18
14	L76625	Loader, scoop, diesel, 4-wheel, 2½-cu yd				12					1	13
15	L85146	Lub svc unit, power-op tlr-mtd				1						1
16	P11866	Pneumatic, tool and compressor outfit, 250 cfm, tlr-mtd				5(7)						5(7)
17	S70243	Stlr, low-bed, wkr, 12-ton, 4-wheel, 40-ft with equip									1	1
18	S70517	Stlr, low-bed, 25-ton, 4-wheel, with equip				10						10
19	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip				(1)						0(1)
20	S72024	Stlr, stake, 12-ton, 4-wheel, with equip									38	38
21	S72983	Stlr, tk, fuel svc, 5,000-gal. 12-ton									20	20
22	S73394	Stlr, tk, trans, 50-ton, 8-wheel, with equip									6	6
23	S73805	Stlr, van, 6-ton, 4-wheel, with equip				1					11	12
24	S74079	Stlr, van, cgo, 12-ton, 4-wheel, with equip									2	2
25	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip									4	4
26	T10138	Shop equip, contact maint, trk-mtd				1					10	11
27	T10275	Shop equip, elec rep, stlr-mtd									1	1
28	T10412	Shop equip, elct rep, stlr-mtd									1	1
29	T13152	Shop equip, org rep, lt, trk-mtd				1					1	2
30	T21235	Shop set, acft maint, stlr-mtd, A-1									1	1
31	T21372	Shop set, acft maint, stlr-mtd, A-2									1	1

Table 1–8. Armored Division Base—Vehicles and Vehicular Equipment—Continued

1	2	2	3	4	5	6	7	8	9	10	11	12
1	Line item number	Unit	HHC (TOE 17-4G)	MP co (TOE 19-27G)	Sig bn (TOE 11-35G)	Engr bn (TOE 5-145G)	Bde HHC (3) (each) (TOE 17-42G)	Armd cav sqdn (TOE 17-105G)	Div arty (TOE 6-300G)	ADA bn C/V, SP (TOE 44-325G)	DISCOM (TOE 29-21G)	Total div base (TOE 17G)
32	V09730	Tagline, crane and shovel, ¾-ton, 1-cu yd bucket				1						1
33	V19950	Tk unit, liq-dispensing, tlr-mtd				6			6	2		14
34	W76816	Trac, full-tracked, low-speed, diesel with bulldozer				8						8
35	W94030	Tlr, ammo, 1½-ton, 2-wheel, with equip				3		2	112			117
36	W94441	Tlr, basic util, 2½-ton, 2-wheel, with equip				2(10)						2(10)
37	W95263	Tlr, cable reel, 3½-ton, 2-wheel, with equip							2			2
38	W95400	Tlr, cgo, ¼-ton, 2-wheel, with equip	21	45	20	39	11	14	83	51	82	388
39	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	5	6	48	12	9	10	121	30	60	319
40	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip	8	2	10	39(33)	5	18	67	41	328	528(522)
41	W96907	Tlr, flat-bed, 10-ton, 4-wheel, with equip				1						1
42	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-wheel, with equip	1	1	3	6	1	5	25	5	19	68
43	X38639	Trk, amb, ¼-ton, 4x4, with equip				1		3		4		8
44	X38776	Trk, amb, ¾-ton, 4x4, with equip	2						6		48	56
45	X38951	Trk, amb, 1¼-ton, 4x4, with equip								1		1
46	X39735	Trk, cgo, ¾-ton, 4x4, with equip	6	6	73	18	11	11	130		72	349
47	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip			1		1	3	69		4	80
48	X39883	Trk, cgo, 1¼-ton, 4x4, with equip								47		47
49	X40009	Trk, cgo, 2½-ton, 6x6, with equip	4	1	25	29(37)	4	9	67	41	194	382(390)
50	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	1	2	60	13(9)	1	14	40	13	29	175(171)
51	X40283	Trk, cgo, 2½-ton, 6x6, extra LWB, with equip							2		1	3
52	X40831	Trk, cgo, 5-ton, 6x6, LWB, with equip						11	48	8		67
53	X40968	Trk, cgo, 5-ton, 6x6, LWB, WWN, with equip						9	75			84
54	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip				22						22
55	X48846	Trk, lift, fork, airmbl, 4,000-lb									3	3
56	X48914	Trk, lift, fork, diesel, 6,000-lb									1	1
57	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip				2(50)						2(50)
58	X57271	Trk, tk, fuel svc, 2½-ton, 6x6, with equip	1				1	4	1		13	22
59	X57408	Trk, tk, fuel svc, 2½-ton, 6x6, WWN, with equip			2							2

60	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip										1	1
61	X59326	Trk, trac, 5-ton, 6x6, with equip				1						61	62
62	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip										1	1
63	X59600	Trk, trac, 10-ton, with equip, dual midship winch, high 5th wheel										6	6
64	X59874	Trk, trac, 10-ton, with equip, midship winch, low 5th wheel				11							11
65	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip										1	1
66	X60833	Trk, util, ¼-ton, with equip	27	45	26	39	14	31	154	51	90		505
67	X61929	Trk, van, expansible, 2½-ton, 6x6, with equip	4										4
68	X62237	Trk, van, expansible, 5-ton, 6x6, with equip								2			2
69	X62340	Trk, van, shop, 2½-ton, 6x6, with equip	4			1		1	10		36		52
70	X62477	Trk, van, shop, 2½-ton, 6x6, WWN, with equip							3		1		4
71	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip			1	1		3	9	1	11		26
72	Y35486	Water purification equip set, trk-mtd 1,500 GPH				5							5
73	Y48255	Welding shop, cgo, tlr-mtd, 300				1					1		2

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

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Table 1-9. Infantry Division (Mechanized) Base—Weapons and Missiles

1	1 Line item number	2 Unit	3 HHC (TOE 37-4G)	4 MP co (TOE 19-27G)	5 Sig bn (TOE 11-35G)	6 Engr bn (TOE 5-145G)	7 Bde HHC (3) (each) (TOE 37-42G)	8 Armd cav sqdn (TOE 17-105G)	9 Div arty (TOE 6-300G)	10 ADA bn C/V, SP (TOE 44-325G)	11 DISCOM (TOE 29-11G)	12 Total div base (TOE 37G)
2	A90117	Armt subsys, hel, 7.62-mm mg (M23)						6				6
3	A90154	Armt subsys, hel, 7.62-mm mg (XM 27)						9				9
4	A90460	Armt subsys, hel, 40-mm, GL (M5)						7				7
5	A90734	Armt subsys, hel, GM lchr (M-22)						4				4
6	D10740	Carr, 107-mm mort, SP						9				9
7	D11048	Carr, cgo, tracked, 6-ton							58			58
8	D11401	Carr, comd and recon, armd	3				3	50				62
9	D11538	Carr, CP, lt-tracked	2				6	6	37			63
10	D12086	Carr, pers, full-tracked, armd				44	4	25		6		87
11	E56577	CEV, full-tracked				8						8
12	K56981	How, hv, SP, 8-in							4			4
13	K57666	How, mdm, SP, 155-mm							72			72
14	L44575	Lchr, gren, 40-mm		16	16	89	11	108	216			478
15	L45534	Lchr, rkt, 762-mm, trk-mtd, with equip (HJ)							4			4
16	L91975	Mg, cal .50, hv, flex	2		10		3	32			4	57
17	L92386	Mg, 7.62-mm, lt, flex		9	3	15	5	13	181	20	68	324
18	M68282	Mort, 4.2-in, on mount						9				9
19	N96741	Pistol, cal .45, auto	32	49	32	161	40	284	254	26	73	1, 131
20	R50543	Recov veh, full-tracked, lt armd					1	5	4	4		16
21	R50680	Recov veh, full-tracked, mdm armd				2			1		4	7
22	R91107	Revolver, cal .38, 2-in. bbl		2								2
23	R91244	Revolver, cal .38, 4-in. bbl	14				4	68	16		11	121
24	R95114	Rifle, 7.62-mm	147	109	609	752(754)	134	527	2, 721	683	2, 283	8, 233 (8, 235)
25	R95251	Rifle, 7.62-mm, auto, with bipod		34		103	6	26		108	10	299
26	R96484	Rifle, rcl, 90-mm		9			2					15
27	U56346	Smg, cal .45					2	38				44
28	V12826	Tk, cbt, full-tracked, 76-mm gun						27				27
29	J96694	Gun, ADA, SP, 20-mm, (XM163)								32		32
30	Z32321	GM sys, AD, Chap XM48								32		32

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Table 1–10. Infantry Division (Mechanized) Base—Vehicles and Vehicular Equipment

1	1 Line item number	2 Unit	3 HHC (TOE 37–4G)	4 MP co (TOE 19–27G)	5 Sig bn (TOE 11–35G)	6 Engr bn (TOE 5–145G)	7 Bde HHC (3) (each) (TOE 37–42G)	8 Armd cav sqdn (TOE 17–105G)	9 Div arty (TOE 6–300G)	10 ADA hm C/V, SP (TOE 44–325G)	11 DISCOM (TOE 29–11G)	12 Total div base (TOE 37G)
2	E02670	Chassis, tlr, GP, 3½-ton, 2-wheel, with equip									1	1
3	E02807	Chassis, tlr, genr, 2½-ton, 2-wheel, with equip								2	5	7
4	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain				3						3
5	H56391	Fftg equip set, trk-mtd, AACFT crash									1	1
6	J35561	Genr set, diesel eng, tlr-mtd, PU-407/M			2							2
7	J35698	Genr set, diesel eng, tlr-mtd, PU-408/M			2							2
8	J41178	Genr set, gas eng, tlr-mtd, PU–290/MR			3						18	21
9	J41315	Genr set, gas eng, tlr-mtd, PU-294/G			2					1	1	4
10	J41589	Genr set, gas eng, tlr-mtd, PU-322/G			1							1
11	J74852	Gd, rd, mtr, diesel, hv, 6×4, frontwheel steer				4						4
12	K90188	Inst rep shop, trk-mtd, 2½-ton, 6×6, with equip			3						15	18
13	L76625	Loader scoop, diesel, 4-wheel, 2½-cu yd				12					1	13
14	L85146	Lub svc unit, power-op, tlr-mtd				1						1
15	P11866	Pneumatic tool and compressor outfit 250-cfm, tlr-mtd				5(7)						5(7)
16	S70243	Stlr, low-bed, wkr, 12-ton, 4-wheel, 40-ft, with equip									1	1
17	S70517	Stlr, low-bed, 25-ton, 4-wheel, with equip				10						10
18	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip				(1)						0(1)
19	S72024	Stlr, stake, 12-ton, 4-wheel, with equip									37	37
20	S72983	Stlr, tk, fuel svc, 5,000-gal, 12-ton									20	20
21	S73394	Stlr, tk, trans, 50-ton, 8-wheel, with equip									6	6
22	S73805	Stlr, van, 6-ton, 4-wheel, with equip				1					11	12
23	S74079	Stlr, van, cgo, 12-ton, 4-wheel, with equip									2	2
24	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip									4	4
25	T10138	Shop equip, contact, maint, trk-mtd				1					1	2
26	T10275	Shop equip, elec rep, stlr-mtd									1	1
27	T10412	Shop equip, elct rep, stlr-mtd									1	1
28	T13152	Shop equip, org rep, lt, trk-mtd				1					1	2
29	T21235	Shop set, acft maint, stlr-mtd, A–1									1	1
30	T21372	Shop set, acft maint, stlr-mtd, A–2									1	1
31	V09730	Tagline, crane-shovel, ¾-ton 1-cu yd bucket				1						1
32	V19950	Tk unit, liq-dispensing, tlr-mtd				6			6	2		14
33	W76816	Trac, full-tracked, low-speed, diesel with bull-dozer				8						8

Table 1–10. Infantry Division (Mechanized) Base—Vehicles and Vehicular Equipment—Continued

1	1 Line item number	2 Unit	3 HHC (TOE 37–4G)	4 MP co (TOE 19–27G)	5 Sig bn (TOE 11–35G)	6 Engr bn (TOE 5–145G)	7 Bde HHC (3) (each) (TOE 37–42G)	8 Armd cav sqdn (TOE 17–105G)	9 Div arty (TOE 6–300G)	10 ADA hm C/V, SP (TOE 44–325G)	11 DISCOM (TOE 29–11G)	12 Total div base (TOE 37G)
34	W94030	Tlr, ammo, 1½-ton, 2-wheel, with equip				3		2	112			117
35	W94441	Tlr, basic util, 2½-ton, 2-wheel, with equip				2(10)						2(10)
36	W95263	Tlr, cable reel, 3½-ton, 2-wheel, with equip				2						2
37	W95400	Tlr, cgo, ¼-ton, 2-wheel, with equip	19	45	20	39	8	14	83	51	83	378
38	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	5	6	48	12	9	10	121	30	59	318
39	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip	7	2	10	39(33)	5	18	67	41	326	525(519)
40	W96907	Tlr, flat-bed, 10-ton, 4-wheel, with equip				1						1
41	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-wheel, with equip	1	1	3	6	1	5	25	5	19	68
42	X38639	Trk, amb, ¼-ton, 4x4, with equip				1		3		4		8
43	X38776	Trk, amb, ¾-ton, 4x4, with equip	2						6		48	56
44	X38951	Trk, amb, 1¼-ton, 4x4, with equip								1		1
45	X39735	Trk, cgo, ¾-ton, 4x4, with equip	6	6	73	18	11	11	130		71	348
46	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip			1		1	3	69		4	80
47	X39883	Trk, cgo, 1¼-ton, 4x4, with equip								47		47
48	X40009	Trk, cgo, 2½-ton, 6x6, with equip	4	1	25	29(37)	4	9	67	41	179	367(375)
49	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	1	2	60	13(9)	1	14	40	13	38	184(180)
50	X40283	Trk, cgo, 2½-ton, 6x6, extra LWB, with equip							2		1	3
51	X40831	Trk, cgo, 5-ton, LWB, with equip						11	48	8		67
52	X40968	Trk, cgo, 5-ton, 6x6, WWN, with equip						9	75			84
53	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip				22						22
54	X48846	Trk, lift, fork, airmbl, 4,000-lb									3	3
55	X48914	Trk, lift, fork, diesel, 6,000-lb									1	1
56	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip				2(50)						2(50)
57	X57271	Trk, tk, fuel svc, 2½-ton, 6x6, with equip	1				1	4	1		13	22
58	X57408	Trk, tk, fuel svc, 2½-ton, 6x6, WWN, with equip			2							2

59	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip											1	1
60	X59326	Trk, trac, 5-ton, 6x6, with equip				1							55	56
61	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip											1	1
62	X59600	Trk, trac, 10-ton, 6x6, with equip, high 5th wheel											6	6
63	X59874	Trk, trac, 10-ton, 6x6, with equip, low 5th wheel				11								11
64	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip											1	1
65	X60833	Trk, util, ¼-ton, with equip	27	45	26	39		14	31	154	51		90	505
66	X61929	Trk, van, expansible, 2½-ton, 6x6, with equip	4											4
67	X62237	Trk, van, expansible, 5-ton, 6x6, with equip									2			2
68	X62340	Trk, van, shop, 2½-ton, 6x6, with equip	4			1			1	10			32	48
69	X62477	Trk, van, shop, 2½-ton, 6x6, WWN, with equip								3			1	4
70	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip			1	1			3	9	1		15	30
71	Y35486	Water purification equip set, trk-mtd 1,500 gal/hr				5								5
72	Y48255	Welding shop, cgo, tlr-mtd, 300-amp				1							1	2

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Table 1-11. Infantry Division Base—Weapons and Missiles

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Line item number	Unit	HHC (TOE 7-4G)	MP co (TOE 19-27G)	Avn bn (TOE 1-75G)	Sig bn (TOE 11-35G)	Engr bn (TOE 5-155G)	Bde HHC (3) (each) (TOE 7-42G)	Armd cav sqdn (TOE 17-105G)	Div arty (TOE 6-100G)	ADA bn C/V, SP (TOE 44-325G)	DISCOM (TOE 29-1G)	Total div base TOE 7G)
2	A90117	Armt subsys, hel, 7.62-mm mg (M23)			25				6				31
3	A90154	Armt subsys, hel, 7.62-mm mg (M27)							9				9
4	A90426	Armt. subsys, hel, 7.62-mm mg 2.75-in. rkt			6								6
5	A90460	Armt subsys, hel, 40-mm GL (M5)			6				7				13
6	A90734	Armt subsys, hel, GM lchr (M-22)							4				4
7	D10740	Carr, 107-mm, mort, SP							9				9
8	D11048	Carr, cgo, tracked, 6-ton								4			4
9	D11401	Carr, comd and recon, armd							50				50
10	D11538	Carr, CP, lt-tracked							6	2			8
11	D12086	Carr, pers, full-tracked, armd							25		6		31
12	E56577	Cbt engr veh, full-tracked					4						4
13	K56981	How, hv, SP, 8-in								4			4
14	K57529	How, towed, 105-mm								54			54
15	K57803	How, mdm, towed, 155-mm								18			18
16	L44575	Lchr, gren, 40-mm		16		16	92	11	108	117			382

17	L45534	Lchr, rkt, 762-mm, trk-mtd (HJ)								4			4
18	L91975	Mg, cal .50, hv, flex	2		10		3	32			4		57
19	L92386	Mg, 7.62-mm, lt, flex	9	6	3	15	2	13	178	20	65		315
20	M68282	Mort, 4.2-in, on mount						9					9
21	N96741	Pistol, cal .45, auto	29	49	2	32	154	35	284	256	26	69	1, 006
22	R50543	Recov veh, full-tracked, lt armd						5	1	4			10
23	R50680	Recov veh, full-tracked, mdm armd					1				4		5
24	R91107	Revolver, cal .38, 2-in. bbl	2										2
25	R91244	Revolver, cal .38, 4-in. bbl		147			4	68	16		9		252
26	R95114	Rifle, 7.62-mm	131	109	218	609	739 (741)	121	527	2, 513	683	2, 181	8, 073 (8, 075)
27	R95251	Rifle, 7.62-mm auto, with bipod	34			103	6	26		108	4		293
28	R96484	Rifle, rcl, 90-mm	9				2						15
29	U56346	Smg, cal .45						38					38
30	V12826	Tk, cbt, full-tracked, 76-mm gun						27					27
31	J96694	Gun, ADA, SP, 20-mm (XM163)								32			32
32	Z32321	GM sys, AD, Chap XM48								32			32

Note. Parenthetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Table 1–12. Infantry Division Base—Vehicles and Vehicular Equipment

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Line item number	Unit	HHC (TOE 7-4G)	Mp co (TOE 19-27G)	Avn bn (TOE 1-75G)	Sig bn (TOE 11-35G)	Engr bn (TOE 5-155G)	Bde HHC (3) (each) (TOE 7-42G)	Armd cav sqdn (TOE 17-105G)	Div arty (TOE 6-100G)	ADA bn C/V, SP (TOE 44-325G)	DISCOM (TOE 29-1G)	Total div base (TOE 7G)
2	E02670	Chassis, tlr, GP, 3½-ton, 2-wheel, with equip										1	1
3	E02807	Chassis, tlr, genr, 2½-ton, 2-wheel, with equip									2	5	7
4	F39241	Crane, wheel-mtd, 5-ton, ⅜-cu yd, air-trans										4	4
5	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain					3						3
6	J35561	Genr set, diesel eng, tlr-mtd, PU407/M				2							2
7	J35698	Genr set, diesel eng, trk-mtd, PU408/M				2							2
8	J41178	Genr set, gas eng, tlr-mtd, PU290/MR				3						16	19
9	J41315	Genr set, gas eng, tlr-mtd, PU294/G				2					1		3
10	J41598	Genr set, gas eng, tlr-mtd, PU322/G				1							1
11	J41931	Genr set, gas eng, tlr-mtd, PU456/G			1								1
12	J74852	Gr, rd, mtr, diesel, hv, 6x4, front-wheel steer					4						4
13	K90188	Inst rep shop, trk-mtd, 2½-ton, 6x6, with equip				3						15	18
14	L76625	Loader scoop, diesel, 4-wheel, 2½-cu yd					12					1	13
15	L85146	Lub svc unit, power-op, tlr-mtd					1						1
16	P11866	Pneumatic tool and compressor outfit 250-cfm, tlr-mtd					5(7)						5(7)
17	S70243	Sltr, low-bed, wkr, 12-ton, 4-wheel, 40-ft										1	1
18	S70517	Stlr, low-bed, 25-ton, 4-wheel, with equip					14						14
19	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip					0(1)						0(1)
20	S72024	Stlr, stake, 12-ton, 4-wheel, with equip										1	38
21	S72983	Stlr, tk, fuel svc, 5,000-gal, 12-ton										10	10
22	S73394	Stlr, tk, trans, 50-ton, 8-wheel, with equip										2	2

23	S73805	Stlr, van, 6-ton, 4-wheel, with equip					1					11	12
24	S74079	Stlr, van, cgo, 12-ton, 4-wheel, with equip										2	2
25	S74490	Stlr, van, expansible, 6-ton, 4-wheel with equip										4	4
26	T10138	Shop equip, contact maint, trk-mtd					1					1	2
27	T10275	Shop equip, elec rep, stlr-mtd										1	1
28	T10412	Shop equip, elct rep, stlr-mtd										1	1
29	T13152	Shop equip, org rep, lt, trk-mtd					1					1	2
30	T21235	Shop set, acft maint, stlr-mtd, A–1										1	1
31	T21372	Shop set, acft maint, stlr-mtd, A–2										1	1
32	V09730	Tagline, crane and shovel, ¾-ton 1-cu yd bucket					1						1
33	V19950	Tk unit, liq-dispensing, tlr-mtd					6			2	2		10
34	W76816	Trac, full-tracked, low-speed, diesel with bulldozer					12						12
35	W94030	Tlr, ammo, 1½-ton, 2-wheel, with equip							2	76			78
36	W94441	Tlr, basic util, 2½-ton, 2-wheel, with equip					38(46)						38(46)
37	W95263	Tlr, cable reel, 3½-ton, 2-wheel, with equip					2						2
38	W95400	Tlr, cgo, ¼-ton, 2-wheel, with equip	20	45	9	20	39	15	14	102	51	78	423
39	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	4	6	20	48	17	11	10	133	30	52	353
40	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip	10	2	22	10	41(35)	6	19	67	41	200	430(424)
41	W96907	Tlr, flat-bed, 10–ton, 4-wheel, with equip					1						1
42	W98825	Tlr, tk, water, 400-gal, 1½-ton 2-wheel, with equip	1	1	2	3	6	1	5	22	5	19	67
43	X38639	Trk, amb, ¼-ton 4 x 4, with equip					1		3		4		8
44	X38776	Trk, amb, ¾-ton, 4 x 4, with equip	2		1					6		48	57
45	X38951	Trk, amb, 1¼-ton, 4 x 4, with equip									1		1
46	X39735	Trk, cgo, ¾-ton, 4 x 4, with equip	5	6	17	73	23	12	11	130		65	366
47	X39872	Trk, cgo, ¾-ton, 4 x 4, WWN, with equip			6	1		1	3	69		4	86
48	X39883	Trk, cgo, 1¼-ton, 4 x 4, with equip									47		47
49	X40009	Trk, cgo, 2½-ton, 6 x 6, with equip	4	1	5	25	29(37)	3	9	64	41	166	353(361)
50	X40146	Trk, cgo, 2½-ton, 6 x 6, WWN, with equip	3	2	7	60	16(12)	1	14	142	13	37	297(293)
51	X40283	Trk, cgo, 2½-ton, 6 x 6, extra LWB, with equip								2		1	3
52	X40831	Trk, cgo, 5-ton, 6 x 6, LWB, with equip							11		8		19
53	X40968	Trk, cgo, 5-ton, 6 x 6, LWB, WWN, with equip							9	50			59

Table 1-12. Infantry Division Base—Vehicles and Vehicular Equipment—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13
Line item number	Unit	HHC (TOE 7-4G)	Mp co (TOE 19-27G)	Avn bn (TOE 1-75G)	Sig bn (TOE 11-35G)	Engr bn (TOE 5-155G)	Bde HHC (3) (each) (TOE 7-42G)	Armd cav sqdn (TOE 17-105G)	Div arty (TOE 6-100G)	ADA bn C/V, SP (TOE 44-325G)	DISCOM (TOE 29-1G)	Total div base (TOE 7G)
54 X43845	Trk, dump, 5-ton, 6 x 6, WWN, with equip					58						58
55 X48846	Trk, lift, fork, airmbl, 4,000-lb										3	3
56 X48914	Trk, lift, fork, diesel, 6,000-lb										1	1
57 X56586	Trk, stake, 5-ton, 6 x 6, WWN, with equip					2(50)						2(50)
58 X57271	Trk, tk, fuel svc, 2½-ton, 6 x 6, with equip			10			1	4	1		10	28
59 X57408	Trk, tk, fuel svc, 2½-ton, 6 x 6, WWN, with equip				2							2
60 X59189	Trk, trac, 2½-ton, 6 x 6, WWN, with equip										1	1
61 X59326	Trk, trac, 5-ton, 6 x 6, with equip					1					51	52
62 X59463	Trk, trac, 5-ton, 6 x 6, WWN, with equip										1	1
63 X59600	Trk, trac, 10-ton, 6x6, with equip, high 5th wheel										2	2
64 X59874	Trk, trac, 10-ton, 6x6, with equip, low 5th wheel					15						15
65 X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip										1	1
66 X60833	Trk, util, ¼-ton, with equip	24	45	10	26	39	18	31	175	51	86	541
67 X61629	Trk, van, expansible, 2½-ton, 6x6, with equip	4										4
68 X62237	Trk, van, expansible, 5-ton, 6x6, with equip									2		2
69 X62340	Trk, van, shop, 2½-ton, 6x6, with equip	4		5		1	2	1	14		35	66
70 X62477	Trk, van, shop, 2½-ton, 6x6, WWN, with equip								3		1	4
71 X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip			1	1	1	1	3	9	1	8	27
72 Y35486	Water purification equip set, trk-mtd, 1,500 gal/hr					5						5
73 Y48255	Welding shop, cgo, tlr-mtd, 300-amp					1					1	2

Note. Parentbetical totals reflect changes necessitated if M4T6 or class 60 bridging is used.

Section IV. ENGINEER AMPHIBIOUS UNITS

1–13. General

a. Engineer amphibious units are designed to provide personnel and units for performance of combat and combat support missions, when suitably augmented, and interim combat service support functions as part of an Army force executing assault landing operations. These amphibious units, whose specific capabilities are listed in paragraph 1–14, are employed in joint or unilateral operations in support of combat forces conducting ship-to-shore or major water-barrier crossing operations.

b. Engineer amphibious units provide the following support:

(1) The engineer amphibious unit commander and commanders of shore party components serve as special staff assistants to the Army landing force commander and commanders of subordinate landing force echelons during planning for the amphibious attack.

(2) Engineer amphibious units provide command, control, and limited combat engineer support for battalion, brigade, division, and corps landing team shore parties. However, engineer amphibious units are supplemented with other combat support and combat service support units to provide shore parties to meet a specific tactical situation.

(3) Engineer amphibious assault units provide a means of ship-to-shore or shore-to-shore movement as well as cross-country mobility to assault landing teams. The use of amphibians, which provide both armor protection and mobility, makes possible a rapid, continuing movement to relatively deep initial objectives without delay at the landing beach. Amphibians are also capable of delivering critical supplies direct to assaulting inland elements and of expediting the evacuation of medical patients and prisoners of war without transfer on the beaches. To maintain an amphibious capability, amphibious vehicles in a combat service support role should be replaced by tactical carriers and organic vehicles as soon as practicable.

c. The TOE organizations of engineer amphibious elements are designed to operate either as control headquarters or in direct support of an amphibious operation. Engineer amphibious companies are allocated to an amphibious task force both in type and number in accordance with the anticipated tactical situation. The following data are based on FM 5–144 and recommended TOE plans and represent the best data currently available.

1–14. Engineer TOE Shore Party Units

a. The engineer amphibious brigade coordinates and controls corps beach support area development initiated by multiple divisions or assumes control and substantially expands the beach support area development accomplished by a single assaulting division. It also provides the command and staff required to control the corps shore party and from one to four attached engineer amphibious groups.

b. The engineer amphibious group coordinates and controls beach support at division and provides the command and staff required to control the division shore party and from one to three engineer amphibious battalions in accordance with the tactical situation.

c. The engineer amphibious battalion provides the command and control for the shore party of a brigade-size landing force during amphibious or shore-to-shore operations and further provides tactical amphibious mobility for dismounted combat units in the passage of water barriers. It consists of a headquarters and headquarters company, one engineer amphibious company, and two engineer amphibious assault companies.

d. Composition of the three echelons of shore parties is illustrated in a typical shore party troop list (table 4–6), which is based on two assault divisions landing abreast. Other details are provided by tables 1–13 and 1–14 (major items of equipment) and table 4–4 (organization).

Table 1–13. Engineer Amphibious Units—Weapons and Missiles

1	1 Line item number	2 Unit	3 HHC engr amph hde (TOE 5–401E)	4 HHC engr amph gp (3) (each) (TOE 5–402E)	5 HHC engr amph bn (9) (each) (TOE 5–406E)	6 Engr amph aslt co (18) (each) (TOE 5–407E)	7 Engr amph co (9) (each) (TOE 5–408E)	8 Total engr amph bde
2	L45260	Lchr, rkt, 3.5-in	3	3	2	4	11	201
3	L92386	Mg, 7.62-mm, lt, flex	1	3	4	----	4	82
4	N96741	Pistol, cal .45, auto	19	17	64	97	10	2, 482
5	R95114	Rifle, 7.62-mm, lt bbl	86	70	146	38	161	3, 743
6		Indiv wpn	105	87	210	135	171	6, 225
7		Crew-served wpn	4	6	6	4	15	283
8		Total wpn	109	93	216	139	186	6, 508

Note: Additional weapons are provided on tracked vehicles listed in table 1–14. Each tracked vehicle has one 7.62-mm mg for a total of 720 additional lmg per engr amph hde. Each combat engr vehicle has 1 cal .50 mg for a total of 18 per engr bde.

Table 1–14. Engineer Amphibious Units—Vehicles and Major Operational Equipment

1	1 Line item number	2 Unit	3 HHC engr amph bde (TOE 5–401E)	4 HHC engr amph gr (3) (each) (TOE 5–402E)	5 HHC engr amph bn (9) (each) (TOE 5–406E)	6 Engr amph co (9) (each) (TOE 5–405E)	7 Engr amph aslt co (18) (each) TOE 5–407E)	8 Total engr amph hde
		Tracked Vehicles						
2	E56577	Cbt, engr veh				2	----	18
3	L37030	Ldg veh, engr			10	----	----	90
4	L37118	Ldg veh, pers					30	540
5	L37013	Ldg veh, comd			6	----	----	54
6	L37132	Ldg veh, recon					1	18
7		Total tracked veh			16	2	31	720
		Wheeled Vehicles						
8	L76234	Lighter amph, 5-ton, LARC V				4	----	36
9	T13152	Shop equip, org rep, lt, trk-mtd			1	----	----	9
10	T10138	Shop equip, contact maint, trk-mtd			2	2	----	36
11	X38776	Trk, amb, ¾-ton, 4x4			2	----	----	18
12	X39735	Trk, cgo, ¾-ton, 4x4	10	----	7	----	----	73
13	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip		13	9	13	2	273
14	X40009	Trk, cgo, 2½-ton, 6x6, with equip	5	3	7	----	----	77
15	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	1	4	3	4	4	148
16	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip				11	----	99
17	X57408	Trk, tk, fuel svc, 2½-ton, 6x6, WWN, with equip	1	----	----	----	----	1
18	X59052	Trk, trac, 2½-ton, 6x6			1	----	----	9
19	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip				1	1	27
20	X59874	Trk, trac, 10-ton, 6x6, low-mtd, 5-wheel			2	----	1	36
21	X59600	Trk, trac, 10-ton, 6x6, high-mtd, 5-wheel				4	----	36
22	X60833	Trk, util, ¼-ton, 4x4	16	8	24	6	1	328
23	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip			1	----	----	9
24		Total wheeled veh	33	28	59	45	9	1, 215

Section V. SPECIAL FORCES GROUP, AIRBORNE

1–15. The Role of the U.S. Army Special Forces

The role of the U.S. Army Special Forces is to contribute to the accomplishment of whatever missions and responsibilities are assigned to the U.S. Army. Therefore, the U.S. Army Special Forces Group is a multipurpose force that, by organization, flexible command arrangements, adjusted logistic and fiscal procedures, and highly trained personnel, can address a variety of missions. As the authority within the Army for unconventional warfare (UW), special forces are constantly prepared to assume missions of this nature during any type of conflict. Since the option for unconventional warfare is selective, special forces are able to employ these highly trained assets on other appropriate and varied missions that contribute to the Army's overall mission.

a. The U.S. Army Special Forces Group. Special forces groups are the major TOE units within the U.S. Army Special Forces and provide command, control, administration, and support for assigned and operational detachments. The special forces group can assume strategic or tactical missions and provide flexible responses. It can undertake a variety of tasks and missions in many modes and configurations; under circumstances and in environments not customarily envisioned for regular forces; and, most importantly, in all levels of conflict. U.S. Army Special Forces may participate either in a primary role or a supporting role in conjunction with other forces or agencies. Deployment for operations may involve only selected individuals or detachments with specific capabilities, or it may require one or more special forces groups.

b. Organization Chart (fig. 1–18).

c. Mission and Capabilities.

(1) *Mission.* As a multipurpose force, the U.S. Army Special Forces are prepared to perform any mission within their capability. These missions range from unconventional warfare to advisory/training duties in preventive insurgency circumstances. Mission possibilities are a direct function of the capabilities of special forces.

(2) *Capabilities.* Special forces possess specific capabilities—

(*a*) To infiltrate and exfiltrate specific areas by air, land, or sea.

(*b*) To survive and operate in remote areas and hostile environments for a long time with a minimum of external direction and support.

(*c*) To plan and conduct military operations including, but not restricted to—

1. Development, organization, equipping, training, and directing of indigenous forces in guerrilla warfare.

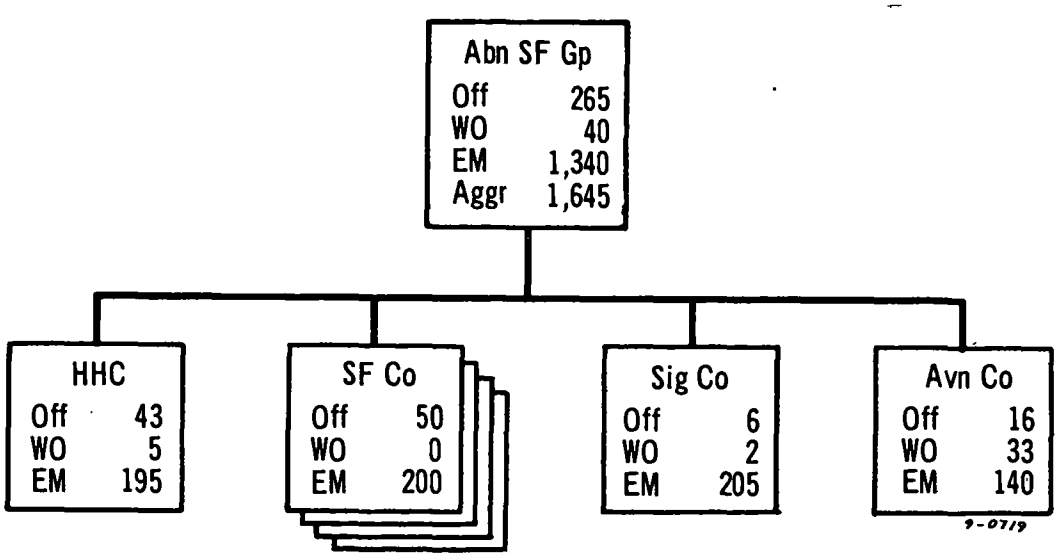

Figure 1–18. Airborne special forces group.

2. Participation in evasion and escape operations or support thereof.

3. Other unconventional warfare missions, either unilaterally or in conjunction with indigenous resistance forces.

4. Training, advice, and assistance to indigenous military or paramilitary forces, to include operational, logistic, and fiscal support.

5. Intelligence, reconnaissance, and surveillance missions in remote or hostile areas, to include underwater operations, long-range patrols, and military free-fall parachute operations.

6. Attack of critical targets in remote, urban, or hostile areas.

7. Recovery of friendly personnel from remote, urban, or hostile areas.

8. Training of U.S. personnel in special forces' operational techniques that have utility in conventional force operations.

9. Planning of assistance to other forces and agencies in connection with special forces activities.

FM 31–21 and FM 31–22 contain further details. Equipment is included in table 1–15.

Table 1–15. Airborne Special Forces Group—Weapons Vehicles and Vehicular Equipment

1	1	2	3	4	5	6	7
1	Line item number	Unit	HHC (TOE 31–106G)	SF co (4 each) (TOE 31–107G)	Avn co (TOE 1–307G)	Sig co (TOE 11–247G)	Total abn SF gp (TOE 31–105G)
		Weapons					
2	A90323	Armt subsys, hel, 7.62-mm mg, quad			8		8
3	A90597	Armt subsys, hel, 2.75-mm in RL XM3			8		8
4	L44575	Lchr, gren, 40-mm			27		27
5	L92386	MG, 7.62-mm, lt, flex			16		16
6	N96741	Pistol, cal. 45, auto		236	72	10	318
7	R91244	Receiver, cal. 38, 4 inch barrel	24				24
8	R94977	Rifle, 5.56-mm, with bipod		249	123	203	575
9	Z76282	Submachinegun, 5.56-mm	217				217
10		Total wpn	241	485	254	213	1, 193
		Aircraft					
11	A306621	Airplane, util, U–1A			4		4
12	A30971	Airplane, util, STOL, U–10C			4		4
13	K31767	Hel, util, UH–1C			4		4
14	K31786	Hel, util, UH–1D			8		8
15		Total acft			20		20
		Wheeled Vehicles					
16	X38639	Trk, amb, ¼-ton	4				4
17	X38776	Trk, amb, ¾-ton, 4x4, with equip	3				3
18	X39735	Trk, cgo, ¾-ton, 4x4, with equip	3		7	1	11
19	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip				1	1
20	X40009	Trk, cgo, 2½-ton, 6x6, with equip	9		8	26	43
21	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	1			3	4
22	X57271	Trk, tk, fuel, svc, 2½-ton, WWN, with equip			4		4
23	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip			1		1
24	X59326	Trk, trac, 5-ton, 6x6, with equip			2		2
25	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip			2		2
26	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip			1		1
27	X60833	Trk, util, ¼-ton, 4x4, with equip	6		9	6	19
28	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip	1				1
29		Total wheeled veh	27		34	37	96

Table 1-15. Airborne Special Forces Group—Weapons Vehicles and Vehicular Equipment—Continued

1	1	2	3	4	5	6	7
	Line item number	Unit	HHC (TOE 31-106G)	SF co (4 each) (TOE 31-107G)	Avn co (TOE 1-307G)	Sig co (TOE 11-247G)	Total abn SF gp (TOE 31-105G)
		Trailers					
30	J35424	Genr set, dsl eng, tlr-mtd, PU-402/M			1		1
31	J41178	Genr set, gas eng, tlr-mtd, PU-290/MR			4		4
32	J41931	Genr set, gas eng, tlr-mtd, PU-456/G			1		1
33	J42000	Genr set, gas eng, tlr-mtd, PU-474/U				11	11
34	J49946	Genr set, gas eng, tlr-mtd, PU-564A/G				1	1
35	P27799	Power plant, elec, AN/MJQ-4				4	4
36	S73531	Stlr, van, cgo, 6-ton, 2-wheel			2		2
37	T21509	Shop set, acft maint, stlr-mtd, B-1			1		1
38	T21646	Shop set, acft maint, stlr-mtd, B-2			1		1
39	T21783	Shop set, acft maint, stlr-mtd, B-3			1		1
40	T21920	Shop set, acft maint, stlr-mtd, B-4			1		1
41	T22057	Shop set, acft maint, stlr-mtd, B-5			1		1
42	T23564	Shop set, acft maint, tlr-mtd, B-6			1		1
43	W95400	Tlr, cgo, ¼-ton, 2-wheel	6		9	6	19
44	W95537	Tlr, cgo, ¾-ton, 2-wheel	3		6	2	11
45	W95811	Tlr, cgo, 1½-ton, 2-wheel	4		6	11	20
46	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-wheel	1		1	1	6
47		Total tlr	14		36	36	86
		Major Vehicular Equipment					
48	B30868	Beacon set rdo AN/GRN-6			1		1
49	D79729	Central ofc tt AN/MGC-9				1	1
50	F76914	Darkroom, photo, ptbl, AN/TFQ-7				1	1
51	H01910	Elect shop shelter, AN/TSM-17				1	1
52	M34804	Con gp, msg, OA-3986/TSC-26 trk-mtd, 2½-ton				2	2
53	N20114	Op cen comm, AN/MSC-31	1			2	3
54	N20662	Op cen, AN/MSC-32				3	3
55	Q33089	Rdo set AN/GRC-106 trk-mtd, ¼-ton			3	5	8
56	Q50754	Rdo set AN/VRC-24 mtd, ¾-ton			1		1
57	Q54618	Rdo set AN/VRC-47 mtd, ¼-ton			3		3
58	Q54692	Rdo set AN/VRC-47 mtd, ¾-ton			1		1
59		Rdo TT set AN/GRC-122			1		1
60	R20873	Rcvr gp, OA-3984/TSC-26 mtd, trk, 2½-ton				2	2
61	V57161	Tml telegraph, AN/MSC-29			1		1
62	X19074	Xmtr gp, OA-3985/TSC-26 mtd, trk, 2½-ton				2	2
63	Z56852	Rdo TT set, AN/GRC-108				6	6
64		Total major veh equip	1		11	25	37

CHAPTER 2

PERSONNEL

Section I. GENERAL

2-1. Introduction

This chapter provides unclassified personnel data for staff officers on division, corps, field army, theater army support command and its subordinate commands, and theater staffs within a theater of operations. (FM 101-10-3 contains the classified data.)

2-2. Chapter Contents

a. Section I outlines the contents of the chapter.

b. Section II provides the staff officers information to estimate losses and the requirements for replacements in—

(1) Combat zone forces of division or larger, both for short periods of a particular type of combat action and for longer periods of a variety of types of action.

(2) Forces in the communications zone.

(3) Forces in theaters of operation. Two methods of varying accuracy are given. In each case, loss estimates are given for the unit concerned as a whole with breakdowns by branch of service. FM 101-10-3, chapter 2, contains classified data pertaining to estimation of losses and requirements for replacements in a theater of operations where the enemy employs nuclear weapons.

c. Section III gives a basis for estimates of prisoners of war and civilian internees by giving experience data under varying conditions of World War II.

d. Section IV gives a basis for estimates of decorations and mail by giving experience data from World War II and the Korean War.

e. Section V gives a basis for estimates of chaplain positions and planning factors for chaplain ecclesiastical items of equipment and supply.

f. Section VI gives a basis for estimates of crime rates and U.S. military prisoners.

Section II. LOSSES AND REPLACEMENTS

2-3. General

A personnel loss is any reduction in the assigned strength of a unit. These losses are caused primarily by enemy action, disease, accidents, and administrative action. The rate of loss varies with the theater of operations, climate, terrain, the condition and state of training of troops, type of activity, the enemy, and numerous other factors. Each division and corps has its own loss experience dependent on its own situation. Loss rates by arm or service and by military occupational specialty within corps and division vary with the exposure of the particular category of personnel to the various causes of losses.

a. Categories of Loses. Personnel losses are recorded in three general categories:

(1) *Battle*, which are those losses incurred in action, including—

(*a*) Wounded or injured in action to include those who died of wounds and died of injuries received in action.

(*b*) Killed in action.

(*c*) Missing in action or captured by the enemy.

(2) *Nonbattle*, which are those losses not directly attributable to being in action, regardless of when sustained, including—

(*a*) Nonbattle dead.

(*b*) Nonbattle accident/injury.

(*c*) Nonbattle missing.

(*d*) Sick/disease.

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(3) *Administrative*, which are those losses including—

(*a*) Transfers from the unit.
(*b*) Absent without leave.
(*c*) Desertion.
(*d*) Rotation of personnel.
(*e*) Discharges.

b. Gross Losses. In addition to those killed, captured, or missing, gross losses include personnel evacuated to hospitals and dropped from the rolls of their units. In all units within the theater army, any man hospitalized or evacuated to a hospital is dropped from unit rolls and carried on the rolls of theater training, transient, and patient (TT&P) strength, which is not chargeable against the authorized theater strength.

c. Net Losses. Net losses are gross losses less personnel returned to duty within the theater. Net losses are computed only at theater level and are used as a basis for estimates of personnel required from the continental United States (CONUS) to maintain theater strength.

d. Loss Experience.

(1) Factors and figures that appear in the tables of this section are based primarily on World War II and Korean War experience and will not apply necessarily during another war. For planning, loss experience of past wars is modified by evaluating new factors applicable to new conditions. As a war progresses, every echelon of command gradually builds up loss experience that more accurately reflects the current conditions. Even the most complete and accurate figures relating to past wars cannot be relied on as valid for any future war. With experience as a basis, good judgment and sound knowledge of principles are used to develop new experience tables applicable to new conditions. Administrative losses are based on changing policies and, except for the confinement rates for military prisoners, are not adaptable to the establishment of loss tables based on experience. Therefore, experience tables for administrative losses, other than confinement, are not included in this manual. Paragraphs 2–19 and 2–20 contain experience tables for losses to confinement.

(2) Since the disease rate is a large part of the nonbattle loss rate, the overall loss rate has seasonal variations and depends on the region where the force is operating. Accidents are the most frequent cause of all nonbattle losses.

2–4. Nuclear Loss Estimates

a. General. The enemy's use of nuclear weapons against U.S. forces results in increased battle losses. Battle losses from nuclear weapons may be divided into two general categories:

(1) Battle losses sustained when a military unit is destroyed. The magnitude of such losses is so great that replacements with individuals is not feasible. Replacements for these battle losses are provided for by unit replacement.

(2) Battle losses sustained when units are on the periphery of the area of damage. Replacements for battle losses in this category come from survivors of destroyed units and from personnel in the individual replacement system.

b. Factors Influencing Losses. No valid experience data exist from which loss experience tables can be complied. The problem of estimating the number of replacements (both unit and individual) required to replace losses to nuclear weapons involves many variable factors. Among the more important of these factors are—

(1) Frequency of enemy employment of nuclear weapons.
(2) Types and yields of weapons employed.
(3) Types of targets selected for nuclear weapon attack.
(4) Effectiveness of enemy target location system.
(5) Accuracy of enemy delivery means.
(6) Protective measures adopted by own forces.

c. Effect of Nuclear Attack. Nuclear attack on CONUS with the attendant damage, contamination, and fallout introduces new elements that will affect the magnitude of disease and nonbattle injury rates among survivors. A preliminary gross estimate that may be used in planning for nulear warfare indicates that a multiplying factor of 2.8 is applied to the nonbattle admission rate as shown for CONUS.

d. Estimation of Battle Losses. Effective battle loss estimation requires an aggressive effort on the part of all agencies, particularly intelligence agencies, to provide specific data to eliminate the variable factors outlined in *b* above or to permit reasonable assumptions concerning these variable factors.

The validity of battle loss estimation is directly proportional to the degree of refinement that can be made in these factors. FM 101-10-3, chapter 2, contains classified information pertaining to nuclear battle losses under conditions of nuclear warfare.

2-5. Unit Replacements

Each theater army is authorized separate units to employ as replacements for units that may become ineffective. The Department of the Army determines the numbers and types of units furnished, based on the recommendations of the theater commander.

2-6. Combat Zone Estimates

a. General. The procedures and data contained in this paragraph apply to the estimation of nonuuclear losses. Because of the possible magnitude of nuclear battle losses and the effect that such losses may have on tactical operations, nuclear battle losses are estimated separately (FM 101-10-3, ch. 2).

b. Purpose of Estimate. Personnel loss estimates at corps and division are used to anticipate the effect of losses on the tactical plan for the handling of replacements within the commands. The estimates have to answer three questions: the strength at any given time, the losses anticipated for a specific situation, and the distribution of these losses by arm or service and military occupational specialty. Combat estimates are of two types: short-period (5 days or less) and long-period (more than 5 days). Estimates at field army are used for the same purposes as at corps and division. In addition, they are used as a basis for allocation of available replacements and to inform higher headquarters of anticipated replacement requirements. Field army and corps headquarters use both short-period estimates and long period estimates. Divisions normally use only short-period estimates.

c. Factors. In calculating losses, there are two major factors to consider—

(1) Loss rates applicable to the specific situations are expressed as percentage of strength or as number per thousand of average strength of any given period. In compilation and use of loss data, units whose loss rates are about the same because of similar operating conditions are grouped together.

(2) Loss rates are applied to the strength of the particular command under consideration. Two different strengths are used—

(*a*) *Authorized strength* is table of organization and equipment (TOE) strength plus additional personnel authorized by higher headquarters. Authorized strength is used in long-range planning and in cases of unknown or rapidly fluctuating assigned strength.

(*b*) *Assigned strength* includes all personnel carried as assigned on the unit's roster. Assigned strength is used, when known in long-period estimates if it differs materially from authorized strength and if it will remain reasonably stable during the estimated period.

d. Short-Period Estimates (Periods Not in Excess of 5 Days).

(1) *General.* Tables 2-1 and 2-2 provide percentages by type of action and by combat arm or branch. Table 2-1 is not used for loss estimates for a period greater than 5 days.

(2) *Distribution of infantry battle losses by selected military occupational specialty within an infantry division.* Personnel losses of maneuver battalions most seriously affect the combat effectiveness of an infantry division. A total of 87.4 percent of the infantry battle losses occurs among riflemen and weapon crewmen (and closely allied specialists), who constitute the larger portion of the infantry division assault battalion's strength. In stability operations, maneuver battalions may experience a substantial increase in the loss rate among noncommissioned officers, grades E4 through E7.

(3) *Distribution of nonbattle losses.* Nonbattle losses in each branch are in the same proportion to the total nonbattle losses as the strength of that branch is to the total strength of the unit.

(4) *Example.* Calculate the total nonnuclear losses of a typical infantry division in the first 3 days of the defense of a position and determine the number of infantry riflemen and weapon crewmen who become battle losses.

(*a*) *Total losses.*

Authorized strength of division (TOE)	17,628
Assigned strength of division (assumed), beginning of first day	15,341
Losses, first day, defense of position (2.2 percent × 15,341—table 2-1, line 9, colm 4)	338

Table 2-1. Daily Personnel Losses as Percentage of Strength

1	General type of operations for the force as a whole	2	3	4	5	6	7	8	9	10
		Division in contact			Divisions in corps and field army reserve			Nondivisional units, corps, and field army [1]		
		Battle loss (percentage)	Nonbattle loss (percentage)	Total percentage	Battle loss (percentage)	Nonbattle loss (percentage)	Total percentage	Battle loss (percentage)	Nonbattle loss (percentage)	Total percentage
2	Covering and security force action	0.9	0.3	1.2	0.3	0.3	0.6	0.3	0.1	0.4
	Attack:									
3	Meeting engagement	2.4	0.3	2.7	0.3	0.3	0.6	0.4	0.1	0.5
4	Of a position—1st day	3.8	0.3	4.1	0.4	0.3	0.7	0.5	0.1	0.6
5	Succeeding days	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
6	Of a fortified zone—1st day	6.3	0.3	6.6	0.5	0.3	0.8	0.7	0.1	0.8
7	Succeeding days	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
	Defense:									
8	Meeting engagement	1.5	0.3	1.8	0.3	0.3	0.6	0.3	0.1	0.4
9	Of a position—1st day	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
10	Succeeding days	1.0	0.3	1.3	0.3	0.3	0.6	0.3	0.1	0.4
11	Of a sector—1st day	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
12	Succeeding days	1.6	0.3	1.9	0.3	0.3	0.6	0.4	0.1	0.5
13	Inactive situations [2]	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4
14	Pursuit	1.3	0.3	1.6	0.3	0.3	0.6	0.3	0.1	0.4
15	Retirement and delayed action	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4

[1] Use divisional loss rates for units attached to a division.
[2] Forces in contact—neither side attacking.

(*a*) *Total losses*—Continued

Assigned strength, end of first day ---------- 15,003
Losses, second day, defense of position (1.3 percent × 15,003—table 2-1, line 10, colm 4) ------ 195
Assigned strength, end of third day ---------- 14,808
Losses, third day, defense of position (1.3 percent × 14,808—table 2-1, line 10, colm 4) ----- 193
Assigned strength, end of third day ---------- 14,615
Total losses, 3 days (338 + 195 + 193) ---------- 726

(*b*) *Battle losses.*

First day, defense of position (1.9 percent × 15,341—table 2-1, line 9, colm 2) ---------- 291
Second day, defense of position (1 percent × 15,050—table 2-1, line 10, colm 2) ---------- 150
Third day, defense of position (1.0 percent × 14,900—table 2-1, line 10, colm 2) ---------- 149
Total battle losses ---------- 590

(*c*) *Infantry battle losses.*

Infantry battle losses (93 percent × 590—table 2-2, line 2, colm 2) ---------- 549
Infantry riflemen and weapon crewmen battle losses (87.4 percent × 549—(2) above) ------ 480

Table 2-2. Distribution of Battle Losses by Branch (Divisions)

1	Branch	2	3	4
		Infantry division (percentage)	Armored division (percentage)	Airborne division (percentage)
2	Infantry	93.0	62.0	85.6
3	Artillery	2.4	3.6	6.9
4	Armor	2.0	23.1	0.0
5	Engineers	1.5	3.3	3.9
6	All others	1.1	8.0	3.6

e. Long-Period Estimates—Combat Zone (Periods in Excess of 5 Days).

(1) *Monthly personnel losses.* Tables 2-3 and 2-4 provide percentages of personnel losses for World War II and the Korean War, respectively.

Table 2-3. Personnel Losses (World War II) (All Theaters)

	1 Troops	2 Battle losses percentage per month	3 Nonbattle losses percentage per month
2	Infantry divisions in combat zone	10.00	8
3	Armored divsions in combat zone	8.00	7
4	Infantry divisions (mechanized) in combat zone	8.15	8
5	Corps and field army nondivisional troops in combat zone	1.25	3

(2) *Types of battle losses as percentage of total battle losses.* Table 2-5 contains percentages for types of battle losses. Table 2-6 contains percentages for losses by branch within corps and larger units. For distribution of losses by branch within divisions, table 2-2 applies. For distribution of nonbattle losses, *d*(3) above applies.

(3) *Example.* Calculate the number of replacements required to bring 1st Corps to authorized strength and to maintain it at that strength in combat for 15 days, assuming no nuclear losses, given—

Unit	*Authorized strength*	*Assigned strength*
Three infantry divisions	52,884	44,780
One armored division	18,112	15,604
Corps nondivisional troops	39,972	38,322
Total corps	110,968	98,706

(*a*) *Replacements needed now.*

Authorized (110,968) assigned (98,706)	12,262

(*b*) *Estimated losses, 15 days.* Infantry divisions (table 2-3, line 2):

Battle losses ½ x 10 percent x 52,884	2,664
Nonbattle losses ½ x 8 percent x 46,818	2,115
One armored division (table 2-3, line 3):	
Battle losses ½ x 8 percent x 18,112	724
Nonbattle losses ½ x 7 percent x 18,112	634
Corps nondivisional troops (table 2-3, line 4):	
Battle losses ½ x 1.25 percent x 39,972	250
Nonbattle losses ½ x 3.0 percent x 39,972	600
Total losses for 15 days	6,967

(*c*) *Total replacements required.*

Replacements need now	12,262
Losses for 15-day period	6,967
Total	19,229

f. Special Estimates for Airborne Operations.

(1) Personnel losses for forces conducting an airborne assault operation may be estimated by applying the applicable daily loss rates from table 2-7 to the assigned strength of units actually committed to the operation.

Note. Rates in this table are for planning purposes only. The rates for each airborne operation differ. The rates in this table are useful as a guide or for use in practicing estimate procedures.

(2) *Example:* Calculate the number of nonnuclear losses that will be sustained by the 102d Airborne Division on D-day and D+1. Takeoff

Table 2-4. Personnel Losses (Korean War)[1]

		Infantry Divisions				
	1 Type of operation	2 Battle losses per division per day[2]	3 Battle losses per division—percentage per month[2]	4 Status distribution—percentage: Killed	5 Wounded	6 Missing
	Offensive:					
2	Against main enemy force	67	11.2	14.6	83.2	2.3
	Against delaying force:					
3	Organized	26	4.3	18.2	69.6	12.2
4	Partly disorganized	12	2.0	18.8	75.9	5.3
5	Against fortified hill positions	34	5.7	17.5	79.4	3.1
	Defensive:					
6	Against main enemy force	77	12.8	25.2	68.8	6.2
7	Main pressure on non-U.S. units	35	5.8	16.1	70.6	13.2
8	Withdrawal	119	19.8	15.2	44.5	40.2
9	Positional warfare	6	1.0	18.6	75.0	6.4

[1] Based on experience 25 June 1950 to 25 July 1953.
[2] Based on assumed average divisional strength of 18,000.

times and H-hour are on D-day. Computations for followup echelon are omitted from this example. Strength of the division (13,449) is echeloned as follows:

Unit	*Strength*
Assault echelon	11,571
Followup echelon	458
Rear echelon	1,045
Airhead—first day:	
Assault echelon (11,858 x 0.096)	1,111
Airhead—second day:	
Assault echelon (11,858—1,111) x 0.023	247
Total losses D-day and D+1	1,358

Table 2–5. Types of Battle Losses as Percentage of Total Battle Losses

	1	2	3	4
1	Battle losses	Infantry divisions (percentage)	Armored divisions (percentage)	Corps and field army nondivisional units (percentage)
2	Killed	16.5	18.0	16.0
3	Wounded	70.0	72.0	84.0
4	Captured and missing	13.5	10.0	(1)

[1] Negligible.

Table 2–6. Distribution of Battle Losses by Branch Within Corps and Larger Units in the Combat Zone as Percentage of Total Battle Losses

	1	2	3
1	Branch	Percentage	
		World War II	Korea War
2	Infantry	81.9	81.1
3	Artillery	4.5	
	Field	(3.6)	5.7
	Air defense	(0.9)	
4	Armor	6.6	5.3
5	Corps of Engineers	3.2	
6	Army Medical Service	2.8	
7	Signal Corps	.2	
8	Quartermaster Corps	.1	
9	Ordnance Corps	.2	7.9
10	Transportation Corps		
11	Chemical Corps	.3	
12	Military Police Corps	.1	
13	Miscellaneous	.1	

Note. The percentage figures given in the World War II portion of this table are the field battle loss distribution as reported through data processing unit channels, European Theater of Operations, for the period 6 June 1944 through 31 March 1945. The figure for armor combines the percentage originally reported as armored forces (2.9 percent), tank destroyer (1.4 percent), and cavalry (2.8 percent). *In actual operations*, the distribution of battle losses by branch varies with the composition of the force, type of operation, etc.

g. Special Estimates for Amphibious Operations.

(1) Nonnuclear personnel losses for amphibious forces establishing a beachhead may be estimated by applying the applicable daily loss rates from table 2–8 to the assigned strength of units actually committed in the beachhead or en route thereto.

Note. Rates in this table are for planning purposes only. The rates for each amphibious operation differ. The rates in this table are for use as a guide only or in practicing estimate procedures.

(2) The amount and type of reinforcement required by divisions making amphibious landings differ for each operation because of the necessity to organize the force to fit the mission, area of operations, lift available, and the enemy situation.

(3) *Example.* Calculate the total of nonnuclear losses that will be sustained during an amphibious operation by 1st Corps on D−1, D-day, and D+1. The following computations are tabulated in table 2–9.

Table 2–9. Worksheet Form—Personnel loss Estimates—Amphibious Operations

Unit	*Assigned strength*
1st Infantry Division	15,606
2d Infantry Division	15,606
3d Infantry Division	15,606
Nondivisional troops, assault echelon	22,632
Nondivisional troops, followup echelon	36,415
Total 1st Corps	105,865

Total 1st Corps will sail at assigned strength. On D-day the 1st and 2d Infantry Divisions will assault the beach in a helicopter and waterborne assault. 3d Infantry Division and nondivisional troops in followup echelon will land on D+1.

(*a*) D−1: *Losses at sea.*

1. Assault divisions. 31,212 x 0.5 percent (table 2–8, colm 2, line 2)	156
2. Nondivisional assault troops. 22,632 x 0.5 percent (table 2–8, colm 2, line 3)	113
3. Following division. 15,606 x 0.5 percent (table 2–8, colm 2, line 4)	78
4. Nondivisional followup troops. 36,415 x 0.5 percent (table 2–8, colm 2, line 5)	182
5. Total 1st Corps D–1 losses	529

(*b*) D-day:

1. Assault landing:

(a) Assault divisions.

31,212–156 x 1.3 percent (table 2–8, colm 3, line 2) ---------- 404

(b) Nondivisional assault troops.

22,632–113 x 1.0 percent (table 2–8, colm 3, line 3) ---------- 225

2. Nonbattle losses.

(a) Assault divisions.

31,212–156–404 x 0.3 percent (table 2–8, colm 4, line 2) ---------- 92

(*b*) D–day—Continued

2. Nonbattle losses—Continued

(b) Nondivisional assault troops.

22,632–113–225 x 0.3 percent (table 2–8, colm 4, line 3) ---------- 67

3. Battle losses.

(a) Assault divisions.

31,212–156–404 x 5.3 percent (table 2–8, colm 5, line 2) ---------- 1,624

(b) Nondivisional assault troops.

22,632–113–225 x 3.0 percent (table 2–8, colm 5, line 3) ---------- 669

Table 2–7. Special Estimates for Airborne Operations

1	1 Type of operation and type of forces committed	2 First day (includes en route and in airhead) (percentage) Nonbattle loss	3 First day Battle loss	4 First day Total	5 Succeeding days (percentage) [1] Nonbattle loss	6 Succeeding days Battle loss	7 Succeeding days Total
	Airborne assault operation:						
	Airborne or infantry division and attached troops:						
2	Assault echelon (parachute and/or assault aircraft) [2]	0.3	9.3	9.6	0.3	2	2.3
3	Followup echelon	.3	2.5	2.8	.3	2	2.3
4	Corps troops	.3	1.5	1.8	.3	1	1.3
	Air-landed operation (inside secured airhead):						
5	Airborne or infantry division and attached troops (to include replacements committed to combat upon arrival) [3]	.3	4.3	4.6	.3	2	2.3
6	Corps troops	.3	1.5	1.8	.3	1	1.3

[1] Upon linkup or when forces in the objectives area are firmly established, rates and methods given in *d* or *e* above for an infantry division are applicable.

[2] For planning purposes and in the absence of experience factors, casualty figures for air-landed assault forces are assumed to be the same as for parachute assault forces.

[3] If not committed to combat, assess losses as for corps troops.

Table 2–8. Special Estimates for Amphibious Operations

1	1 Force	2 Phase I—Forces en route: Daily at sea [1] Nonbattle and battle loss (percentage)	3 Phase I—Forces en route: Landing Battle loss (percentage)	4 Phase II—Forces in beachhead: First day Nonbattle loss (percentage)	5 First day Battle loss (percentage)	6 First day Total (percentage) [2]	7 Succeeding days [3] Nonbattle loss (percentage)	8 Succeeding days Battle loss (percentage)	9 Succeeding days Total (percentage)
	Assault forces: [4]								
2	Divisions and attached troops	0.5	1.3	0.3	5.3	5.6	0.3	1.5	1.8
3	Corps and field army troops	.5	1.0	.3	3.0	3.3	.3	1.0	1.3
	Followup forces: [5]								
4	Divisions and attached troops	.5	.5	----------			.3	1.5	1.8
5	Corps and field army troops	.5	.5	----------			.3	1.0	1.3

[1] Rates in this column include both battle and nonbattle losses en route and are distributed by arm or service in the same proportion to the total losses as the strength of each arm or service is to the strength of the total force being transported.

[2] After beachhead is secure and forces are building up for the breakout (phase III), the rates and methods given in table 2–1 or tables 2–3 and 2–4 apply. The rates in this table apply only until the beachhead is firmly established.

[3] Losses are distributed as given in *d*(3) above for nonbattle losses; table 2–2 or table 2–6 for battle losses by arm or service; table 2–2 for battle losses by category (killed, wounded, captured, and missing).

[4] Assault forces in this table are those units who make their landing in the face of enemy opposition at or near the beachhead. For purposes of computing total division rates, the assumption is that an assault division lands 1 brigade by helicopter behind the beaches and 1 brigade over the beaches, followed by the reserve brigade and the remainder of the division.

[5] Followup forces in this table include those landing over beaches secured by other friendly forces.

(*b*) D-day—Continued

4. Losses at sea.

(a) Followup division.
15,606-78 x 0.5 percent (table 2-8, colm 2, line 4) ---------- 78

(b) Nondivisional followup troops.
36,415-182 x 0.5 percent (table 2-8, colm 2, line 5) ---------- 181

5. Total 1st Corps D-day losses.
1+2+3+4 ---------- 3,340

(*c*) D+1:

1. Landing losses:

(a) Followup division.
15,606-78-78 x 0.5 percent (table 2-8, colm 3, line 4) ---------- 177

(b) Nondivisional followup troops.
36,415-182-181 x 0.5 percent (table 2-8, colm 3, line 5) ---------- 180

2. Beachhead losses.

(a) Assault divisions.
31,121-156-404-92-1-624 x 1.8 percent (table 2-8, colm 9, line 2) -- 521

(b) Nondivisional assault troops.
22,632-113-225-67-669 × 1.3 percent (table 2-8, colm 9, line 3) -- 280

(*c*) D+1—Continued

2. Beachhead losses—Continued

(c) Followup division.
15,606-78-78-77 × 1.8 percent (table 2-8, colm 9, line 4) ------ 277

(d) Nondivisional followup troops.
36,415-182-180 × 1.3 percent (table 2-8, colm 9, line 5) ---- 466

3. Total 1st Corps D+1 losses.
1+2 ---------- 1,901

2-7. Communications Zone Estimates

a. In estimating the nonnuclear gross losses for all ground troops in the communications zone, battle losses are considered negligible, and nonbattle losses are calculated at 0.5 percent per month. Arm or service distribution of nonbattle losses is determined by applying this nonbattle loss percentage to the strength of each arm or service in the command considered. Any lack of air superiority requires the TASCOM planner to develop battle loss rates. Experience data for such rates do not exist.

Table 2-9. Worksheet Form—Personnel Loss Estimates—Amphibious Operations

1	1 Forces	2	3	4	5	6	7	8	9	10
		D-1			D-day			D+1		
		Rate (percentage)	Strength	Losses	Rate (percentage)	Strength	Losses	Rate (percentage)	Strength	Losses
	Phase I—force at sea:									
2	Assault divisions	0.5	31,212	156						
3	Nondivisional assault troops	.5	22,632	113						
4	Followup division	.5	15,606	78	0.5	15,528	78			
5	Nondivisional followup troops	.5	36,415	182	.5	36,233	181			
	Landing:									
6	Assault divisions				1.3	31,056	404			
7	Nondivisional assault troops				1.0	22,519	225			
8	Followup division							0.5	15,450	77
9	Nondivisional followup troops							.5	15,450	180
10	Total—phase I			529			887			257
	Phase II—forces in beachhead:									
	Assault divisions:									
11	Nonbattle losses				.3	30,652	92	1.8	28,936	521
12	Battle losses				5.3	30,652	1,624			
	Nondivisional assault troops:									
13	Nonbattle losses				.3	22,294	67	1.3	21,558	280
14	Battle losses				3.0	22,294	669			
15	Followup division							1.8	15,373	277
16	Nondivisional followup troops							1.3	35,872	466
17	Total—phase II						3,340			1,801

b. Before a planner can estimate losses to nuclear weapons, he needs certain information on enemy capabilities (para 2–4). If specific information cannot be obtained, he makes assumptions. By applying target analysis methods to selected critical target areas, he can evolve a basis for estimating nuclear losses (FM 101–10–3).

2–8. Theater Estimates—Nonnuclear

(See FM 101–10–3, ch. 2, for theater estimates—nuclear.)

a. General. The wide range of loss rates pertinent to potential U.S. Army areas of operations makes infeasible the presentation of a single set of loss factors for worldwide application. Table 2–10 (European data base), however, illustrates what can be done in formulating a theater-level estimating tool using the admission to hospital rates shown in chapter 6. This table is designed for only rough, quick estimates, not as a substitute for factors carefully chosen to fit the specific assumptions and conditions of a particular operational plan. Nonbattle dead and missing are considered negligible for purposes of this estimate.

b. Estimation of Losses. Losses may be estimated by using table 2–10 or by—

(1) Determining battle casualty and nonbattle casualty losses of combat zone troops (para 2–6):

(*a*) Divisional.

(*b*) Nondivisional.

(2) Determining nonbattle accident/injury or troops in the communications zone (para 2–7).

(3) Adding (1) and (2) above.

Table 2–10. Theater Losses

1	1 Type of loss	2 Gross loss	3 Net losses (by evacuation policy) 15 days	4 30 days	5 60 days	6 90 days	7 120 days	8 150 days	9 180 days
2	Sick/disease and nonbattle accident/injuries	1. 62	0. 61	0. 28	0. 15	0. 11	0. 08	0. 05	0. 05
3	Battle casualties	. 78	. 79	. 60	. 47	. 41	. 37	. 35	. 33
4	Killed	(. 14)	(. 14)	(. 14)	(. 14)	(. 14)	(. 14)	(. 14)	(. 14)
5	Wounded/injured in action	(. 55)	(. 46)	(. 37)	(. 24)	(. 18)	(. 14)	(. 12)	(. 10)
6	Captured and missing in action	(. 09)	(. 09)	(. 09)	(. 09)	(. 09)	(. 09)	(. 09)	(. 09)

Note. Factors expressed as number per 100 strength per day.

Section III. ENEMY PRISONERS OF WAR AND ENEMY CIVILIAN INTERNEES

2–9. General

a. To insure the availability of necessary resources and to make necessary arrangements for the reception, care, use, and disposition of enemy prisoners of war (PW) and enemy civilian internees, a planner estimates as closely as possible for a given period or for a specific operation the number of enemy—

(1) PW's that will be captured.

(2) Civilians that will be interned.

(3) PW's that will be retained in the theater of operations.

(4) PW's that will be evacuated from the theater of operations.

b. Extensive nonnuclear warfare experience factors are available with respect to the capture and evacuation of enemy PW's. Based on these experience factors, capture and evacuation rates, expressed mainly in terms of averages, have been developed and incorporated in this section. Nevertheless, planners should bear in mind that prisoners are not characteristically captured at a uniform rate, and the figures cited in this section represent averages that may be greatly altered by such influencing factors as—

(1) Enemy morale.

(2) Avenues of withdrawal open to enemy troops.

(3) Ability of friendly forces to encircle or cut off enemy units.

(4) Type of operation in which friendly forces are engaged; i.e., attack, defense, retrograde.

(5) Operational environment.

(6) Relative strength and sophistication of enemy forces.

(7) Intensity and effectiveness of ideological indoctrination of enemy troops.

(8) Intensity and effectiveness of friendly psychological operations.

c. Available experience factors regarding the internment and security of enemy civilians do not permit the development of planning factors as reliable as those for enemy PW's. The number of enemy civilians that will be interned in specific situations may vary greatly. Planners may, however, develop workable estimates using the factors cited in this section as modified by such considerations as—

(1) Extent to which enemy civil authorities and agencies work with enemy military forces.

(2) Intensity and effectiveness of ideological indoctrination of enemy officials and the general populace.

(3) Intensity and effectiveness of friendly psychological operations aimed at influencing the enemy civil populace.

(4) Extent to which the enemy populace supports the political and military goals of the enemy government.

2–10. PW Capture Rates, Nonnuclear Conditions

a. General. The figures and planning factors presented in this paragraph are based primarily on the experiences of U.S. Army forces in World War II and the Korean War. Of necessity, the experiences represented are those of the kind of organizations, principally divisions, that existed during those two wars. Present-day infantry, armored, and airborne divisions are sufficiently similar to their predecessor organizations to make these experience factors applicable. In the case of the infantry divisions (mechanized), which has come into existence since Korea, the figures and factors cited represent interpolations based on the organizational and operational characteristics of the new organization. Data have not yet been developed for the airmobile division.

b. Division and Corps Estimates. Using the rates set forth below, estimates may be prepared directly for divisions and certain nondivisional units. By combining appropriate estimates developed from these tables corps capture rates may be developed.

(1) *Equal force estimates.* When the opposing enemy forces are approximately equal in number and sophistication to U.S. forces, the average number of enemy PW's who may be expected to be captured per month can be estimated by using the percentage factors in table 2–11:

Table 2–11. Prisoner of War Capture Rates—Equal Force Estimates

1		2
	Troops	Percentage of strength
2	Infantry divisions	1. 35
3	Infantry divisions (mechanized)	1. 10
4	Armored divisions	. 80
5	Airborne divisions	. 65
	Corps and field army nondivisional units:	
6	Armored cavalry regiments	. 85
	Separate combat brigades:	
7	Infantry brigades	. 90
8	Infantry brigades (mechanized)	. 75
9	Armored brigades	. 55
10	Airborne brigades	. 45
11	Other units	(1)

[1] Negligible.

(2) *Unequal force estimates.* For the preparation of estimates for divisions (or comparable task forces) and corps in selected types of tactical operations against a numerically inferior enemy, the daily rates in table 2–12 may be used. These figures apply to all types of divisions, except the airmobile division and as otherwise indicated, and are based primarily on the experiences of U.S. divisions in the Korean War and World War II against veteran enemy troops. In these instances, the U.S. forces were numerically superior by about 2 to 1.

c. Theater Estimates. For overall estimates at theater under nonnuclear conditions, the factors in table 2–13 may be used. These factors should be used with full awareness of their limitations. They represent averages derived from World War II and Korean War experience or interpolated from such experience. Since prisoners are not captured at uniform rates, special preparations are made for the reception of unusual numbers when tactical plans contemplate decisive action, such as cutting

major routes of withdrawal or driving large enemy forces against an obstacle or when widespread enemy capitulation is anticipated.

Table 2–12. Prisoner of War Capture Rates—Unequal Force Estimates

	1	2
1	Force and operation	Number of prisoners captured per day
2	Average per division in all types of operation	47
3	Division in attack of a defensive position	50
4	Division in attack of a defensive position with complete surprise attained	700
5	Division in defense of a position against an unsuccessful enemy attack	300
6	Infantry division (mechanized) (or task force) in an encirclement operation	815
7	Armored division (or task force) in an encirclement operation	1, 000

Table 2–13. Prisoner of War Capture Rates

	1	2	3	4	5
		Enemy prisoners of war per month			
				Enemy capitulation	
1	Unit	Defense (U.S.)	Offense (U.S.)	First month	Succeeding month
2	Infantry division	230	3, 500	6, 000	30, 000
3	Infantry division (mechanized)	175	3, 550	6, 000	30, 000
4	Armored division	117	3, 600	6, 000	30, 000
5	Airborne division	155	2, 550	6, 000	30, 000

2–11. PW Capture Rates, Nuclear Conditions

a. Experience factors that may be used as a basis for estimating PW capture rates under nuclear conditions are lacking. Using target analysis methods, however, planners can estimate enemy casualties and determine approximately the number of enemy personnel remaining in the strike area and subject to capture in the exploitation phase.

b. Because the employment of nuclear weapons produces a demoralizing effect on enemy troops, an overall increase in the number of enemy PW captured can be expected. In the absence of more definitive guidance, planners may apply a factor of 2 to the rates set forth in paragraph 2–10.

2–12. Evacuation of PW From the Theater of Operations

a. The Department of Defense, using recommendations from the Department of the Army or the Joint Chiefs of Staff, establishes the PW evacuation policy for the theater of operations. These policies are subject to change as the strategic and tactical situations change. Conceivably, some campaign plans may provide for the retention of all enemy PW in the active theater; in other situations, all or a major proportion of the PW may be evacuated from the active theater. The evacuation policies for each major specific campaign are determined early in the planning phases so that the necessary resources for both retention and evacuation may be made available. The evacuation policy, in all events, must be consistent with the terms of the Geneva Conventions of 1949 and other applicable international agreements.

b. Table 2–14 reflects the number of enemy PW, expressed in terms of division slice, that will normally be retained within the active theater for labor and associated purposes. The figures in this table are based on empirical data derived from past experience, primarily of U.S. forces in Europe during World War II.

Table 2–14. Retention of Prisoners of War in Active Theater

	1	2
1	Purpose for retention in theater	Number per division
2	To provide a theater PW labor pool	4, 000
3	To provide for PW housekeeping, administration, etc.	2, 666
4	Total (division slice)	6, 666

2–13. Enemy Civilian Internees

a. Internment. The Department of Defense or the Department of the Army establishes broad national policies regarding the internment of enemy civilians. In certain types of limited field operations, such as against an unsophisticated enemy in a stability operation environment, the number of enemy civilians interned may exceed the number of enemy PW captured. When military operations result in the movement of large num-

bers of refugees, potential civilian internees are invariably among the refugees. While no dependable internment rates can be established, the following percentage factors may be generally used in preparing estimates until such time as more specific guidance and information become available:

(1) Factors applicable to the local static population—

When the civilian population is—	*Percentage of the population interned*
Mainly hostile	0.1 to 0.5
Mainly friendly	0.05 to 0.1

(2) Factors applicable to the estimated number of refugees (estimates derived from these factors are added to those developed from the application of the factors in (1) above)—

When the refugees are—	*Percentage of the refugees interned*
Mainly hostile	2 to 5
Mainly friendly	0.1 to 0.5

b. Evacuation. In accordance with the provisions of the Geneva Convention Relative to the Protection of Civilian Persons in Time of War, civilian internees are not normally evacuated from the theater of operations but are retained within the occupied territory. Civilian internees are not evacuated beyond the bounds of the occupied territory except when, for material reasons, avoidance of such displacement is impossible.

Section IV. PERSONNEL SERVICES

2–14. General

The data presented in paragraphs 2–15 and 2–16 are for planning purposes only and do not represent doctrine. The figures have been compiled from the experience of the European Theater of Operations in World War II and the Korean War by averaging the experience of several units over several periods of time.

2–15. Decorations

Table 2–15 contains figures pertaining to the awarding of decorations, based on the needs per month of 10,000 troops.

2–16. Mail

Table 2–16 contains data pertaining to mail, based the needs per month of 10,000 troops (see also table 5–48).

Table 2–15. Decorations Data

1	1 Decoration	2 Approximate average
2	Distinguished Service Cross	9
3	Distinguished Service Medal	1
4	Silver Star	103
5	Legion of Merit	20
6	Distinguished Flying Cross	6
7	Soldier's Medal	7
8	Bronze Star Medal	565
	Heroism	(270)
	Meritorious Achievement	(295)
9	Air Medal	*85
10	Commendation Medal	485
11	Purple Heart	1, 175

*Because of recent and large-scale employment of airmobile operations within the Army, this figure has trebled.

Table 2–16. Mail Data

1	1 Conditions	2 Pieces	3 Weight in pounds	4 MTON of shipping space
	Wartime			
	Surface:			
	Incoming (to the theater)—			
2	Third- and fourth-class mail	26, 650	49, 754	155. 481
	Outgoing—			
3	Third- and fourth-class mail	1, 436	2, 675	8. 328
	Air:			
	Incoming—			
4	Airmail	265, 083	6, 165	17. 614
5	First-class mail	97, 450	2, 256	6. 429
	Outgoing—			
6	Airmail	205, 549	4, 757	13. 591
7	First-class mail	54, 973	1, 270	3. 629

Table 2-16. Mail Data—Continued

1	Conditions	2 Pieces	3 Weight in pounds	4 MTON of shipping space
	Peacetime			
	Surface:			
	Incoming (to the theater)—			
8	First-class mail	199,010	5,763	16.466
9	Other	10,910	43,453	135.791
	Outgoing—			
10	First-class mail	52,250	1,075	3.071
11	Other	12,480	47,926	149.769
	Air:			
	Incoming—			
12	Airmail	148,183	4,306	12.303
13	First-class mail	82,830	3,765	10.757
14	Parcel post	870	3,187	9.959
	Outgoing—			
15	Airmail	261,018	5,118	14.623
16	First-class mail	47,234	1,243	3.551
17	Parcel post	975	3,656	11.425

Section V. CHAPLAIN COMBAT SERVICE SUPPORT

2-17. General

Chaplains assigned or attached to battalions, groups, brigades, commands, and other headquarters provide religious services. The chaplain general support detachment (TOE 16-4) establishes and operates theater army-wide general support of chaplain activities. When combat, combat support, and combat service support elements are structured, the units that make up the force will provide the chaplains, or the chaplains will be provided from other available sources such as the chaplain professional team, TOE 29-500, when supplemental converage is required.

2-18. Chaplain Planning Factors

a. When chaplain coverage is provided for a force, personnel planning factors are as follows:

(1) Chaplain positions are authorized for units of the field army in the ratio of 1 for 700 troops or major fraction thereof.

(2) Chaplain positions are authorized all other units in the ratio of 1 for 850 troops or major fraction thereof.

(3) Above authorizations exclude chaplain positions for hospitals and convalescent centers. Planning factors for medical units are contained in AR 310-32.

(4) One primary duty chaplain assistant position is authorized each chaplain position. Aditional administrative chaplain assistant positions at staff levels above battalion are authorized by TOE and tables of distribution and allowance (TDA).

(5) Additional details on planning factors are found in AR 611-101, AR 611-201, and FM 16-5.

b. Chaplain equipment and supply authorizations are based on appropriate TOE and CTA 50-922 and TA 50-989. Chaplain ecclesiastical equipment and supply are classified as nonexpendable and expendable.

(1) Nonexpendable ecclesiastical items mainly consist of line items authorized in appropriate TOE as well as items of individual issue in the possession of chaplains. These items normally are carried with the unit chaplain. Table 2-17 provides illustrative wartime replacement factors for nonex-

pendable ecclesiastical items required by chaplains in an active theater.

(2) The theater or force commander may authorize other nonexpendable ecclesiastical items based on CTA 50–922. Such authorization depends on such factors as the mission of the combat forces, their relative stability and degree of combat activity, the types of personnel (to include prisoners of war and civilian internees) to receive chaplain support, and the degree of permanent or semipermanent chapel construction authorized or the religious facilities available.

(3) Expendable items of ecclesiastical supply are provided in accordance with the number of chaplains and auxiliary chaplains authorized and the number of religious services conducted (to include services conducted for PW and civilian internees). Authorized peacetime allowances are contained in TA 50–989. Some of these items may be locally procured, depending on the geographic area. Table 2–18 lists certain expendable ecclesiastical supplies essential to the chaplain support mission in an active theater.

Table 2–17. Wartime Replacement Factors—Nonexpendable Ecclesiastical Equipment

1	1 Item	2 Unit	3 Pounds	4 STON	5 Replacement factor*
2	Altar, portable, aluminum, leg-style; 39 in. high, 60 in. long, 24 in. diam	Each	15. 0	0. 007	0. 083
3	Chest, hymnbook, fibercovered	Each	15. 0	. 007	. 083
4	Chaplain kit: Protestant active combat application	Each			. 042
5	Chaplain kit: Catholic active combat application	Each			. 042
6	Chaplain, kit, Jewish	Each	25. 0	. 0125	. 042
7	Flag, distinguishing, chaplain, Christian/Jewish	Each	0. 25	(1)	. 083
8	Organ, electric: 24 volts DC, 115 volts AC, folding, 49 keys	Each	70. 0	. 035	. 042

*Replacement factor = the average monthly recurring issue demand per using chaplain.
1 Negligible.

Table 2–18. Combat-Essential Expendable Ecclesiastical Supplies

1	1 Item	2 Unit	3 Pounds	4 STON	5 Allowances [1]	6 Basis of issue
2	Candles, altar, 100-percent beeswax, 24/box, 8/pound	Box	3.0	0.0015	2.0	Per chaplain per quarter
3	Fair linen, altar, white cloth, 42 in. long, 14 in. wide	Each	(3)	(3)	2.0	As required per chaplain
4	Host, Communion, 1⅛ in. diam, 125/package, 4 package/box	Box	0.5	(3)	(4)	1 Host per communicant
5	Host, Communion, 2½ in. diam, 25/package	Package	0.1	(3)	(4)	As required per using chaplain
6	Hymnbook, song and service, hard cover, 6¾ in. long, 4⅞ in. wide	Each	0.25	(3)	0.5	Per military person in field unit
7	Religious literature, miscellaneous	Package	50.0	0.025	(5)	Per chaplain per quarter
8	Supplies, kosher, perishable [2]	Case	30.0	0.015	(5)	Per Jewish chaplain per month
9	Juice, grape, sacramental use, 24-pt bottles or cans/case	Case	36.0	0.018	(4)	1 bottle or can per 75 communicants
10	Wine, angelica, white, 12⅛-gal bottles/case	Case	36.0	0.018	1.0	Per chaplain per quarter
11	Wine, kosher, red, 12⅛-gal bottles/case	Case	38.0	0.019	1.0	Per 24 Jewish personnel/Passover/Seder. Plus per Jewish chaplain per quarters

[1] To these allowances must be added a percentage for breakage, pilferage, spoilage. This percentage will vary depending on climate, type of handling, and shipping and supply security.
[2] Transported by air from nearest source of procurement.
[3] Negligible.
[4] As required.
[5] Not available.

Section VI. CRIME RATES AND U.S. MILITARY PRISONERS

2–19. Crime Rates

a. To make the necessary arrangements for the detection, investigation, and disposition of criminal incidents requires the preparation of an advance estimate of the number of such incidents that will occur within a given time in a command. Experience indicates that there will be little variance in the overall crime rate between peacetime and wartime. In a theater of operations, there will be variance between the combat and the communication zones, with the bulk of the serious crimes occurring in the latter.

b. Based on extensive statistical data, covering both peacetime and wartime, the average annual crime rate within any command will approximate 37.06 serious crimes per 1,000 military population. This planning factor increases in dependability in direct proportion to the size of the command; and, in a theater of operations, it is best suited for theater-level planning.

c. Crime rate planning factors may be used as the basis for determining the personnel requirements for criminal investigators in a command. Experience has shown that one criminal investigator can effectively accomplish an average of 34 criminal investigations per year. Thus, it follows that, on the average, criminal investigators should be assigned to a command on the basis of one to approximately 1,000 military personnel.

2–20. Military Prisoners

a. General. The confinement, care, employment, and disposition of U.S. military prisoners represent command responsibilities that planners should not overlook in preparing for the conduct and support of tactical operations. The number of U.S. military prisoners that must be guarded, processed, employed, evacuated, and restored to duty is of direct interest and application to planners in arriving at requirements for transportation, construction, and personnel. The factors and figures set forth in this paragraph are, with respect to nonnuclear conditions, based on extensive statistical data derived from commands of various types and sizes in a wide range of operational environments. These factors may be applied to a command of any size, but will prove most dependable for theater-level planning. The factors cited for nuclear conditions represent a general increase over the nonnuclear factors, based on the assumption that the employment of nuclear weapons will have an overall demoralizing effect and will create an increased opportunity for crime. These factors should be used with an awarenesss that they are not based on experience and may require extensive alteration in a specific situation.

b. Confinement Rates.

Conditions	*Percentage of command population*
(1) Nonnuclear	1
(2) Nuclear	2

c. Evacuation from and Retention in the Theater of Operations. The Department of Defense or the Department of the Army establishes basic policies regarding the evacuation of U.S. military prisoners from the theater. These policies may be subject to change depending on variations in both the strategic and the tactical situations. Normally, U.S. military prisoners who are not restorable to duty, who have been sentenced to punitive discharge, or who have more than 6 months to serve are evacuated to CONUS. Of all U.S. military prisoners confined in the theater of operations, the following factors expectedly may apply under both nuclear and nonnuclear conditions when normal evacuation policies have been established:

Nuclear and nonnuclear conditions	*Percentage*
(1) Evacuated to CONUS disciplinary barracks	34
(2) Retained in theater rehabilitation training centers	30
(3) Retained in stockades in the theater	36

d. Restoration Rates. For planning purposes, the following factors regarding the restoration of U.S. military prisoners to duty may generally apply:

Restoration rates	*Percentage*
(1) From stockades	100
(2) From rehabilitation training centers	39
(3) From disciplinary barracks	7.7

CHAPTER 3

INTELLIGENCE—MAPPING AND AIRPHOTOGRAPHY

Section I. GENERAL

3-1. Intelligence

The military intelligence (MI) organization provides intelligence specialist support to major commanders from division to theater army levels to assist in the production of intelligence. The MI organization includes trained MI, counterintelligence, and field intelligence personnel, along with necessary administrative and technical personnel. For detailed data concerning organizational concept and intelligence planning, see FM 30-5, FM 30-9A, FM 101-10-3, and TOE 30-25. Special intelligence units and detachments (MI organization) are presented in paragraph 4-2, table 4-4.

3-2. Mapping and Airphotography

Mapping and airphotography are intelligence items. Succeeding sections in this chapter provide basic data on responsibilities and factors for estimating various logistic needs in connection with these items. This information is for general planning only. The specific problem of providing map support for an operation should be coordinated with the engineer of the planning echelon.

3-3. Functions and Responsibilities

Functions and responsibilities pertaining to mapping and airphotography are given in AR 117-5.

Section II. MAPPING

3-4. Types and Scales of Military Maps

a. Types.

(1) *Planimetric map*—a map that presents the horizontal positions only of the features represented.

(2) *Topographic map*—A map that presents the horizontal and vertical positions of the features represented.

(3) *Plastic relief map*—A topographic map printed on plastic and molded into three-dimensional form.

(4) *Photomap*—A reproduction of a photograph or photomosaic upon which gridlines, marginal data, place names, and boundaries are added and which, in some instances, depicts relief graphically.

(5) *Pictomap*—A special type of photomap that overcomes the readability deficiency of the regular photomap and that can be produced much more rapidly than the standard topographic map.

(6) *Plastic relief photomap*—A photomap printed on plastic and molded into three-dimensional form.

(7) *Military city map*—A large-scale topographic map (usually 1:12,500) of a town or city.

(8) *Special maps*—Maps designed for a special purpose, e.g., trafficability maps, transportation maps, and boundary maps.

(9) *Terrain model*—A three-dimensional representation of an area, modeled in plaster, sponge rubber, or other materials. It is distinguished from other types of maps in that some cultural and terrain features are shown in realistic model form rather than by topographic symbol.

(10) *Photomosaic*—Assembly of airphotographs to form a composite picture.

b. Scales.

(1) *Small-scale military maps* are available in scales of 1:40,000,000, 1:10,000,000, 1:5,000,000, and 1:1,000,000. These scales of maps are needed for general planning and for strategic studies by commanders of large units.

(2) *Medium-scale military maps* are available in scales of 1:500,000 and 1:250,000. These scales of maps are required for planning operations, including movements and concentrations of troops and supplies. They are used as detailed planning

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maps, as graphics to illustrate briefings, as bases for medium-scale plastic relief maps, as roadmaps, and for phases of close air-ground support. When no larger scales are available, they are used as tactical maps and to assist field artillery in fire control.

(3) *Large-scale military maps* are available in 1:50,000 scale. This scale of map is intended to meet the tactical, technical, and administrative needs of field units.

3–5 Requirements for Maps

a. General. To calculate quantities of maps required for an operation, the following must be determined:

(1) The number of sheets of each map scale (i.e., the area coverage required at each scale). Data must be obtained from map indexes of the area concerned.

(2) The number of copies of each sheet required for initial issue. Data are in *b* below.

(3) The number of copies of each sheet required for replenishment issues. Data are in *c* below.

(4) The total copies of each scale required. This total equals sheets × initial copies + replenishment.

b. Copies for Initial Issue.

(1) *Guides for estimating quantities.*

(*a*) *General.* Small- and medium-scale maps (other than roadmaps) and aeronautical charts are issued in small quantities to headquarters only. Army aircraft also use 1:250,000-scale JOG–G and JOG–A maps or both, issued one per aircraft. The basis of issue is the unit headquarters, and quantities vary in proportion to the size of the unit. Basic figures for headquarters map allowances are given in table 3–1.

(*b*) *Large-scale maps.*

1. General. Bases used in computing allowances of large-scale maps vary with the type of the unit. The company is the basic unit for computing large-scale map requirements. Headquarters and service companies use the same basis as other companies. Allowances for unit headquarters are given in table 3–1. In addition, an allowance of one copy per organic Army aircraft is made.

2. Infantry and combat engineer units. Allowances for infantry and combat engineer units are on the basis of two copies per platoon. The basis of issue for small unit operations is one copy per squad.

3. Armored and infantry (mechanized) units. Allowances for armored and infantry (mechanized) units are the same as for infantry units plus an additional allowance of one per tank and carriage and two per armored personnel carrier with armament.

4. Artillery units. Allowances for headquarters and service batteries are the same as for infantry units. Allowances for firing batteries are on the basis of one per section plus two per forward observer and liaison officer.

5. Airborne units. Allowances for airborne units are the same as for equivalent ground troops.

6. Other units. Map requirements for other units are on the basis of one per officer and one per reconnaissance noncommissioned officer.

(*c*) *Roadmaps.* Roadmaps are issued one per vehicle and in limited quantities to unit headquarters.

(*d*) *Aeronautical charts.* Besides the headquarters allowances, aeronautical charts are issued on a basis of two per organic Army aircraft.

(*e*) *Photomaps.* Photomaps are issued as substitutes for large-scale maps when the latter are not available. When necessary as supplements to topographic maps, photomaps are issued in qauntities not exceeding those authorized for topographic maps.

(*f*) *Pictomap supplement.* Pictomap supplements have the same basis of issue as photomaps.

(*g*) *Hydrographic charts.* Hydrographic charts are issued to units and headquarters as required by the situation and the mission of the unit.

(*h*) *Headquarters.* Besides the guides stated in table 3–1 indicates the number of copies of each sheet needed by unit headquarters.

(2) *Summary of totals.* Table 3–2 gives the number of copies of each different sheet for initial issue for average operations and includes a small reserve to be held under unit control.

c. Replenishment Requirements. The field army requires under its control (besides the initial issue) in field army map depots 100 percent of the initial requirements of all three scales.

Table 3-1. Headquarters Map Allowances

1	Unit	2 Smallscale maps	3 Mediumscale maps	4 Largescale maps	5 Roadmaps	6 Aeronautical charts' [a]	7 Plastic relief maps
2	Field army HQ	25	75	50	75	50	One per general officer.
3	Corps HQ	15	40	75	50	25	
4	Div HQ	5	25	55	50	10	
5	Bde HQ	1	7	[b] 14	15	3	
6	Bn HQ	0	3	[b] 12	5	0	
7	Co HQ	0	1	(c)	1	0	

[a] Add 1 per organic aircraft.
[b] Bde and bn needs for service units are 50 percent of those for combat units.
[c] 50 percent of the needs for combat co in (b) above, or one copy per co, whose needs are based on officer strength.

Table 3-2. Summary of Map Totals

1	Unit	2 Smallscale maps [a]	3 Medium-scale maps [a]	4 Largescale maps [a]	5 Road maps	6 Aeronautical charts [b]
2	Fld army HQ and all fld army nondivisional troops	50	600	1, 500	4, 500	200
3	Corps HQ and all corps nondivisional troops	40	600	1, 500	3, 000	100
4	Inf div	25	250	1, 190	2, 750	150
5	Inf div (mech)	8	200	1, 650	3, 650	150
6	Armd div	8	200	1, 650	3, 650	150
7	Abn div	8	150	[c] 1, 000	2, 100	140

[a] *Number* of plastic relief maps not included.
[b] Production and distribution are Air Force responsibilities. Normally, Air Force distribution to troops is in bulk to CONUS and theater army support command map depots; the engineer makes detailed distribution.
[c] Is 1,500 for airborne operations.

d. Overall Planning Factors.

Initial issue—
Field army 2,700,000 sheets ..... 135 tons.
Corps 420,000 sheets ..... 21 tons.
(Republic of Vietnam experience indicates values 70 percent higher for initial issue per corps.)
Replenishment—
Field army 18,000 sheets per day .. 9 tons per day.

e. Map coverage. Table 3-3 shows map coverage arranged by scale of map.

f. Typical Planning Procedure. The field army G2 confers with the G3 to determine the types and scales of maps to be used by subordinate units and field army headquarters. An operational map is selected for use by field army and corps headquarters so that all orders, overlays, and references will be based on the same map. The field army engineer attends these staff conferences to advise on the availability of maps in field army and base map depots, capacity of reproduction facilities, and types and scales that can be most readily reproduced. The G3 outlines the area for which map coverage is desired. This area will be well in advance of the present friendly forward dispositions of the field army because of the time required for procurement, production, reproduction, and distribution of maps. In addition, maps of the future area of operations are required early

*Table 3-3. Ground Map Coverage by Scale**

1	Scale	2 Miles N-S	3 Miles E-W	4 Square miles	5 1 inch = approx (miles)
2	1:1,000,000	276.0	318.0	88, 000	16.0
3	1:250,000	70.0	100.0	7, 000	4.0
4	1:100,000	35.0	25.0	875	1.6
5	1:50,000	17.0	14.0	238	0.8
6	1:25,000	8.5	6.5	55	0.4

*Average figures are given for approximately 40° north latitude. The figures increase toward the Equator and decrease toward the poles.

for planning purposes. The G3 also outlines tentative future dispositions, direction of attack, and boundaries of field army and subordinate units. The engineer uses this tentative information in determining map requirements for the field army. The procedure is as follows:

(1) Lay out the projected field army area for which coverage is desired on the pertinent index map.

(2) In the field army area outlined on the index map, lay out the tentative corps and division boundaries. Project these boundaries to cover the entire area for which map coverage is desired. While these projected boundaries will change during the campaign, divisions and corps of the field army will operate in the area. Therefore, calculations based on one pattern of operations are valid for map procurement purposes.

(3) List the units requiring each map sheet. Divisions in reserve will require map sheets of the entire front in which they may be employed.

(4) List the identifying numbers of the map sheets required to cover the area included within the field army boundaries, including sheets bordering closely on the boundaries.

(5) Determine the number of copies of each sheet required at each echelon, using factors presented herein or developed from experience factors.

(6) List the total number of copies of each map sheet required. These are planning figures for initial issue. Replenishment requirements are determined by multiplying the number of each sheet required for initial issue by the proper percentage factor given in *c* above. The sum of the initial requirement plus the replenishment requirement for each sheet represents the total number of copies of each sheet that must be procured. These are procured from higher echelon or produced by topographic units in the field army.

3–6. Production of Maps

a. General Production Factors.

(1) Map requirements are estimated well in advance of an operation. Requirements in excess of the production capability of theater topographic units are requisitioned from the continental United States (CONUS).

(2) Press size_____ 22½ by 30 (or 29) inches.
(3) Impressions per press-day_____ 25,000 (bulk work only, two 10-hour shifts).
(4) Average map paper consumption per field army_____ 5,000 reams per month
167 reams per day.
(5) Maximum map paper consumption per field army_____ 500 reams per day.
(6) Photomap paper consumption per field army_____ 1,000 reams per month.
(7) Recommended number of colors or press impressions—
Maximum _____8.
Standard _____5 (black, brown, blue, green, and red).
Expedient _____1, 2, 3.
Supplements _____1–8.

Two-and three-color maps are superior in readability to one color and should be adopted when time for standard color reproduction is not available.

b. Production Capacity Required.

(1) *Field army.* Three million impressions per month (two 10-hour shifts per day).

(2) *Theater army* (one base topographic battalion for each three field armies supported).

(*a*) Five million impressions per month for each three field armies supported.

(*b*) A new mapping capacity of 256 square kilometers per day.

3–7. Storage of Maps

a. General Planning Factors.

(1) *Map paper.* Table 3–4 shows storage requirements for map paper.

(2) *Crated or bundled maps.* Table 3–5 shows storage requirements for bundled or crated maps.

(3) *Plastic relief maps.* There are many variations in sizes and weights of plastic relief maps. For specific information on storage of this type of map, consult experience factors or the Army Map Service.

b. Floor Space.

(1) A base map depot for each group of three field armies requires 45,000 square feet, increasing at the rate of 7,500 square feet per month of operations.

Table 3-4. Map Paper—Storage

1	1 Sheet size (in.)	2 Line map—high wet strength (lb per 1,000 sheets)[1 2]	3 Photomap—coated two sides (lb per 1,000 sheets)[2]
2	22½ by 29	99	113
3	22 by 29	94	108
4	24 by 34	121	131
5	26 by 32	123	141
6	28 by 50	208	236
7	35 by 45	231	265
8	Thickness, 1,000 sheets	4 in.	3.5 in.

[1] For U.S. hydrographic charts, use twice the weights shown.
[2] Weights vary from those indicated ±5 percent.

Table 3-5. Crated or Bundled Maps—Storage

1	1 Item	2 Avg wt (lb)	3 Avg cu ft (for storage)
2	Bundle, 500 map sheets	60	2
3	Crate, 1,000 map sheets	150	5

(2) A base map depot for each air force requires 10,000 square feet, increasing at the rate of 2,000 square feet per month of operations.

(3) An advance map depot serving a field army requires 10,000 square feet.

3-8. Distribution of Maps

a. General. Several factors establish maps as a peculiar supply item that must be handled separately through a system set up exclusively for this purpose. The special factors that place map distribution in a class by itself are as follows:

(1) *Security.* Bulk production, movement, and issuance of maps are accurate indexes of the scope of forthcoming operations.

(2) *Transitory application.* Changes in culture, as revealed by the constantly expanding sources of information, may quickly render maps obsolete and require several improved editions or issues in the course of a single operation.

(3) *Relationship to the operation.* Unlike other supply items, maps have a direct relationship to the exact place in which the operation is to occur.

(4) *Phasing of supply.* In general, bulk stocks of maps cannot be prepared, and distribution planned, far in advance. However, collection of source material for map production must be constant and worldwide. Production must be phased to insure the application of the last bit of terrain information that can be safely used. Issue can be made only after an exact assignment of missions has been made.

b. Responsibility.

(1) The engineer computes map requirements for a command under the staff supervision of the G2. Requisitions are prepared and submitted through engineer channels in time to permit reproduction and shipment of the maps required.

(2) Engineers of corps and larger units distribute military maps in the field, except those maps with a security classification, which may require special handling. The supply and transport battalion of the division support command (DISCOM) distributes maps in divisions. Maps not printed within an echelon are obtained from the engineer of the next higher unit.

c. Depots.

(1) *Peacetime and CONUS.* Distribution of maps during peacetime and for the CONUS is made by requisitions drawn on the theater or the Army Map Service through channels prescribed by the Chief of Engineers.

(2) *Wartime theater of operations.*

(*a*) The Army Map Service in the theater of operations establishes maps supply depots, which in turn establish map supply points. The map supply depots serve both the map supply points and field army map depots. The map supply points serve communications zone units.

(*b*) Field army map depots receive and store bulk stocks from the map supply depot and in turn supply maps to field army units, the field army support command (FASCOM), and corps map depots.

(*c*) The corps map depots receive and store bulk stocks from the field army map depot and supply maps to corps units and to DISCOM's.

(*d*) Operation of the division map store is the responsibility of the DISCOM commander. The only functions performed are to receive bulk stocks, distribute maps to divisions and attached units, and store the division reserve map stocks.

d. Labor Estimates. Map depot labor may be estimated at 20 man-hours per 10,000 maps issued,

including rolling, coding, packing, and collating unit packages.

e. Normal Map Distribution Flow Chart. Figure 3–1 portrays the normal flow of map distribution.

3–9. Terrain Models and Plastic Relief Maps

The determination of quantity requirements and the issuance of terrain models and plastic relief maps are matters for staff control. Terrain models and plastic relief maps are seldom stocked outside

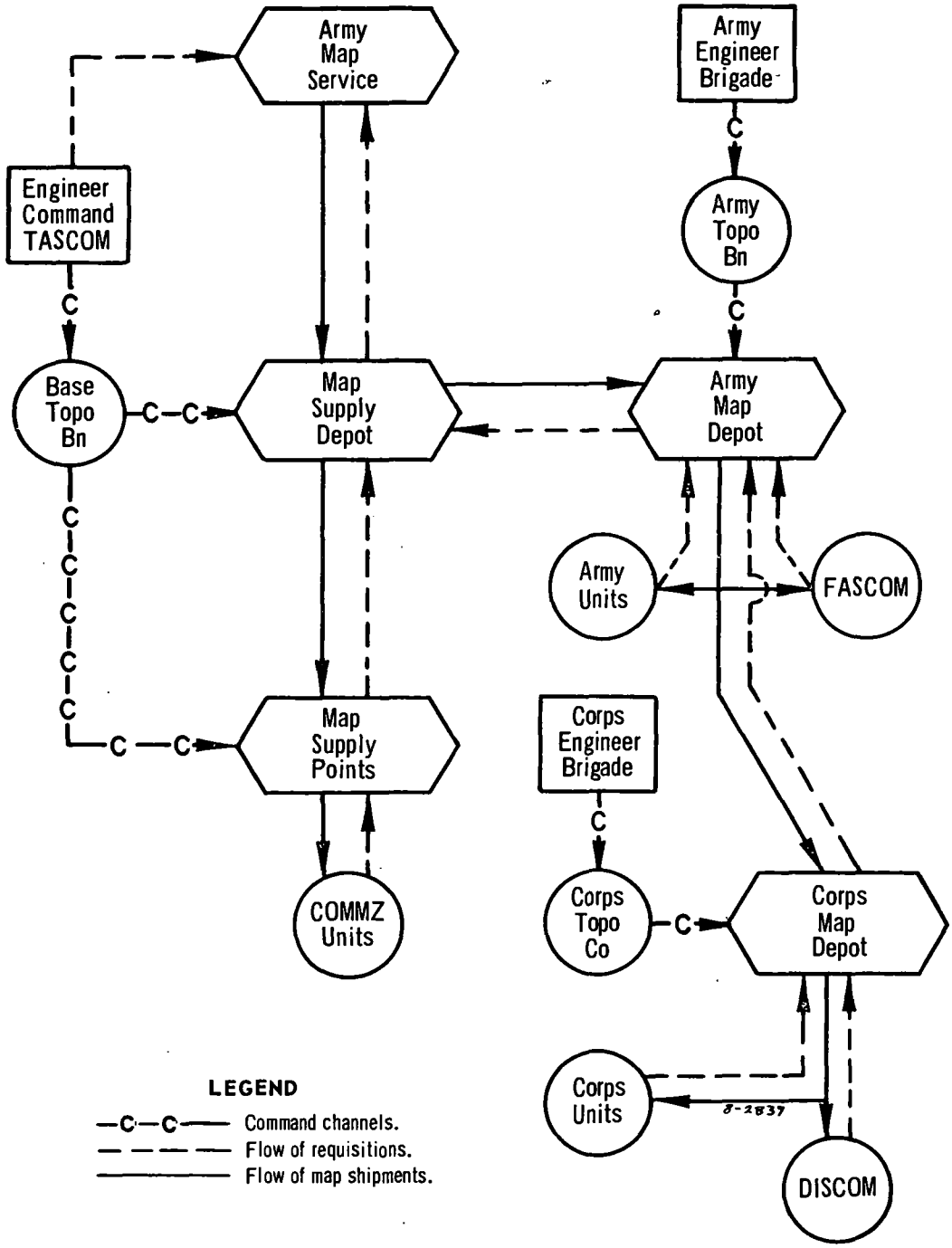

Figure 3–1. Normal map distribution flow chart.

base plants. The Army Map Service is currently the only base plant for terrain models and stocks plastic relief maps at scales of 1:250,000, 1:100,000, and certain miscellaneous scales. These maps can be requisitioned through engineer channels. Quantity requirements depend solely on the estimate of the military situation. The necessary provisions to meet these requirements are determined by staff studies of combat needs; the resultant production and supply of models and plastic relief maps are determined by command decision. The commander, having modelmaking units under his control, directs that a G2 intelligence study and an engineer technical appraisal be performed to determine which models are to be constructed. When assigned modelmaking capacities are inadequate, the commander submits appropriate requests to higher headquarters. On completion of construction, the model is issued immediately and directly to the headquarters or command for which it was produced.

3–10. Gazetteers

a. Gazeteers (place-name indexes) are issued to higher headquarters only. Initial allowances per medium-scale map series are as follows:

Theater headquarters	25
Theater army headquarters	25
Army group headquarters	10
Field army headquarters	5
Corps headquarters	2
Division headquarters	2

b. Production, storage, and distribution of gazetteers are identical with mapping responsibilities (para 3–3); in the CONUS, the Corps of Engineers is responsible; in a theater of operations, the theater army engineer.

3–11. Trig Lists

a. General. A trig list is an organized grouping of data defining geodetic control positions. The respective elevations, descriptions, and other pertinent information for these ground control points appear within the limits of a map or maps of a certain series to which they are keyed. The horizontal positions are generally arranged by increasing northings on the map sheet so that the user can locate quickly any point on a given map sheet of a series. The vertical stations (bench marks) along the lines of spirit leveling are usually arranged consecutively along the route of the leveling survey.

b. Bulk Stocks of Trig Lists. Trig lists normally are provided in bulk at each of the following echelons:

(1) Army group headquarters and army group troops.
(2) Field army headquarters and field army troops.
(3) Corps headquarters and corps troops.
(4) Airborne division.
(5) Airmobile division.
(6) Armored division.
(7) Infantry division.
(8) Infantry division (mechanized).

c. Number of Trig Lists at Each Map Scale (i.e., area coverage required at each scale). The scale of the map sheet to which each trig list is keyed and the number of map sheets covered by a particular trig list vary from country to country because of density and distribution of the geodetic control. Therefore, it is necessary to determine the number of map sheets covering the specific area and relate this information to the *Trig List Catalog*, from which the scale and number of map sheets covered per trig list can be determined. A trig list key number appears in the *Trig List Catalog* and on the cover of each trig list. For identification and logistic reference the trig list key number is used.

(1) *Field army area coverage.* The number of different trig lists required per field army can be determined on the same basis as for maps.

(2) *Division and smaller unit area coverage.* The number of trig lists required to cover an average area of operations can be determined on the same basis as for maps.

d. Guides for Estimating Quantities of Trig Lists Required for Initial Issue.

(1) Trig lists should be distributed only to those units having a requirement for geodetic data (i.e., staff engineers, engineer topographic units, artillery units, missile units).

(2) Besides the guides stated in (1) above, the following quantities are needed by units indicated.

Note. In most foreign countries trig lists are classified CONFIDENTIAL.

Unit	Number of trig lists
(a) Army group:	
Army group engineer	1
Survey liaison detachment	1
(b) Field army:	
Field army engineer	1
Engineer bn (army) (topo)	2
(c) Corps:	
Corps engineer	1
Engineer co (corps) (topo)	2
Corps artillery	10
Per wpns bn	1
(d) Infantry division:	
Division artillery	8
HHB	3
FA bn, 105-mm (towed) (each 1)	3
FA bn, 155-mm (towed)/8-in (SP)	1
FA bn, HJ	1
Division engineer	1
(e) Infantry division (mechanized):	
Division artillery	13
HHB	3
FA bn, 155-mm (SP) (each 2)	6
FA bn, 155-mm/8-in (SP)	2
FA bn, HJ	2
Division engineer	1
(f) Armored division:	
Division artillery	13
HHB	3
FA bn, 155-mm (SP) (each 2)	6
FA bn, 155-mm/8-in (SP)	2
FA bn, HJ	2
Division engineer	1
(g) Airborne division:	
Division artillery	6
HHB	2
FA bn, 105-mm (towed) (each 1)	3
Division engineer	1
(h) Airmobile division:	
Division artillery	7
HHB	2
Avn btry	1
FA bn, 105-mm (towed) (each 1)	2
FA bn, 105-mm (towed) (abn)	1
FA bn, aerial artillery	1
Division engineer	1

(i) U.S. Army missile command. Quantities are determined by the mission.

e. Production of Trig Lists.

(1) *Responsibilities.* Compilation and printing of trig lists are normally accomplished by the Army Map Service (CONUS) and all military topographic units (theater of operations) having the geodetic data and survey results necessary to compile field sketches for each station, to prepare bilingual descriptions, and to compute necessary coordinate systems required for the area. Trig lists produced in the CONUS are considered adequate reproduction material and can be reproduced in the theater of operations by military topographic units.

(2) *Format.* Trig lists are normally bound publications of ¼- to ½-inch thickness, with a trim size of 9 by 11 inches, and are printed on map stock, high wet-strength paper. However, variations of this may be found in the field.

Section III. AIRPHOTOGRAPHIC IMAGERY

3-12. Types and Categories

a. Types of Permanent Record Imagery. Permanent record imagery can be obtained through the use of conventional photographic cameras, infrared (IR) sensor devices, and radar.

(1) *Classification of conventional photography.* Conventional photography is classified by the cameras position and the area of coverage.

(a) Classification by cameras position is as follows:

1. Vertical—Coverage of a target with photography taken from directly overhead. It provides photography of relatively constant scale and allows the interpreter to get the best stereovision and most accurate measurements.

2. Oblique—Coverage of a target area with the photography taken at an angle from the vertical. Oblique photography presents a view of the target area similar to that the pilot has while he flies toward or parallel to it. Oblique photography closely resembles the normal eye view and allows an interpreter to "see" into an area in a normal fashion rather than to see the target as it appears from directly overhead. High oblique photography includes a portion of the skyline behind the target area; low oblique photography does not. Oblique photography taken with an 80-percent overlap between frames allows stereoviewing.

3. Panoramic—Coverage by a special

camera that scans across a wide area of the terrain, usually from horizon to horizon. Panoramic photography provides rapid coverage of large areas of terrain on both sides of an aircraft's line of flight in only one pass over the target area.

(*b*) Classification by area of coverage is as follows:

1. Pinpoint—Coverage of a single point, feature, individual target, or small area of terrain by a small number of photographs. A minimum of 60-percent overlap between individual photoframes is necessary to insure stereoviewing.

2. Strip—A continuous series of overlapping photographs taken in a single flight line that covers a lengthy target or a large area of terrain.

3. Continuous strip—A single strip of photography that contains an unbroken image throughout the length of the flight line. This type of photography requires a special camera and eliminates the need for individual photoframes with overlap throughout the length of the strip.

4. Area—Two or more strips of photography that overlap to the side. A minimum of 30-percent sidelap between strips, besides the 60-percent overlap between frames, is necessary to provide stereoviewing throughout the area of coverage. The main use of area photography is in planning or for comparing coverage by inspection with other imagery available. Area photography with the proper overlap and sidelap can be used to make photomosaics. Normally, area photography is vertical photography.

5. Mapping—Mapping or charting photography taken for the purpose of preparing or revising maps and charts. Usually, it is taken at much smaller scales than intelligence photography and should be used for intelligence purposes only when no other intelligence photography is available. This photography is taken with special stabilized cameras and other equipment, and the flight pattern and evaluation of the aircraft are carefully controlled.

(2) *IR imagery.* An IR system is a passive sensor that detects emitted and reflected thermal radiation coming from the terrain and objects on on the terrain. Current IR systems filter out reflected radiation and record only the radiation emitted by the object. The total emitted radiation is a function of an object's temperature and its emissivity. Emitted radiation differs between objects and the resultant differences are sensed and recorded by the IR system. The IR sensor can detect minute differences and thus differentiate objects close to one another. To achieve the maximum capability, the IR system must operate at low altitude, and its scan coverage is limited to the area directly below the flightpath of the aircraft. Therefore, it normally is used only for point, linear, or small area targets.

(3) *Side-looking airborne radar.* Side-looking airborne radar (SLAR) is an active electronic device that emits energy and senses that portion of the emitted energy which is returned by reflection off the terrain and objects thereon. The radar's energy may be directed at the terrain to the left, right, or both sides simultaneously along the flightpath of the aircraft. The energy reflected from the objects on the ground, both fixed and moving, is recorded on strips of film. It should be noted that since the radar pulse is line of sight, any high ground or tall objects in the path of the radar pulse block out radar returns from any smaller objects they mask. This causes SLAR returns to leave blank spots, called radar shadow, wherever these hidden areas occur.

b. Categories of Permanent Record Imagery. The three categories of permanent record imagery commonly used by the imagery interpreter are initial record, general intelligence record, and detailed intelligence record. The availability of improved imagery interpretation equipment in the tactical imagery interpretation facility (TIIF) allows the usable scales of photography to be increased in each category as indicated in (1) through (3) below.

(1) *Initial record.* Initial record is complete, permanent imagery coverage—usually flown seasonally—of a projected or actual area of operations generally extending from the line of contact with enemy ground forces to deep within enemy territory. Photographic coverage is normally of small scale (1:20,000 to 1:60,000) and suitable for stereoscopic study. Initial record provides basic information about enemy installations and defenses, cultural features, trafficability, soil, and vegetation. Its principal purpose is to provide a basic for evaluating changes in enemy-held territory. Areas subject to seasonal changes are recorded under conditions characteristic of each season to eliminate the observed differences caused by seasonal varia-

tions. Vertical initial record may serve as a map substitute or supplement. The field army normally supervises the automatic initial distribution to subordinate units according to areas of interest and makes supplementary issues as necessary.

(2) *General intelligence record.* General intelligence record is vertical medium-scale (1:10,000 to 1:20,000) imagery coverage in the field army area of interest. It provides current intelligence information and is compared with initial record imagery to determine current location and disposition of enemy installations, troop concentrations, troop movements, equipment, and supplies. Normally, this type of imagery is requested by division and higher headquarters.

(3) *Detailed intelligence record.* Detailed intelligence record supplements the general intelligence record by providing large-scale imagery of areas of specific interest. It provides the imagery for detailed analysis of specific enemy activity, selected terrain features, installations, or equipment. It is frequently necessary to use more than one sensing or recording system over the target. Types of detailed analysis are shown in (*a*) through (*d*) below.

(*a*) *Vertical.* The study of large-scale (1:10,000 and larger) photography reveals the plans and heights of installations not shown in the general intelligence record.

(*b*) *Oblique.* The study of airphotographs taken at an angle from the vertical reveals installations from the elevation standpoint. This type of imagery is particularly important in the analysis of features not suitable for vertical analysis, such as concealed or well-camouflaged installations.

(*c*) *Concealment.* Installations and equipment hidden from observation may be detected and subjected to study by special recording techniques; for example, a camouflage net located through general intelligence record imagery may be identified as a covering for mechanical equipment when the area is subjected to IR search.

(*d*) *Deception.* Enemy measures designed to deceive and confuse friendly intelligence collection agencies may be detected through analysis and comparison of photographic and electronic presentations (e.g., radar, IR, and electronic intelligence) collected at or near the same time.

3–13. Requirements for Airphotography

a. An initial issue of basic cover is made to field army units according to their requirements. Supplemental issues are made as required during the progress of the campaign. Typical initial issue of basic cover is shown in table 3–6.

b. Detailed planning data for determining the number of airphotographs required to cover a given area are contained in TM 30–245. For general planning purposes, the minimum number of photographs required for stereoscopic coverage of an area at a desired scale can be determined by dividing the square meters of the area by the net gain per photograph. The minimum number of photographs should be increased by 20 percent to allow for overedge coverage. The net gain planning factors are as follows:

(1) For 9- by 18-inch photography—
Net gain=1/40 S^2 (S=denominator of scale of desired photography).

(2) For 9- by 9-inch photography—
Net gain=1/80 S^2.

Example:

Given: An area 8,000 meters by 12,000 meters to be photographed at a scale of 1:5,000.

Find: The number of 9- by 18-inch photographs required.

Solution: $\frac{8{,}000 \times 12{,}000 \times 40}{5{,}000^2} = 154$ photographs minimum.
154+20 percent=185 total photographs required.

c. Table 3–7 may be used for initial rough estimates of airphotographic requirements.

3–14. Airphotographic Reproduction and Imagery Interpretation

Functions of two sections of the MI detachment, MI battalion, air reconnaissance support, field army (TOE 30–5G), are illustrated in tables 3–8 and 3–9. Data on the functions of two Air Force photographic units are contained in table 3–10.

Table 3–6. Typical Initial Issue of Basic Cover—Airphotographs

1	1	2	3	4	5	6	7
	Unit or agency	Number of sets	Depth into enemy territory (km)	Number of 9- by 9-inch photographs		Total (approx lb)	
				1:25,000	1:10,000	1:25,000	1:10,000
2	Theater army, base topo bn	2 sets theater army area	480	40,000	248,000	1,332	8,266.
3	Fld army G2 (MI bn, air recon spt, fld army).	(Based on 160-km width) 2 sets fld army zone/sector.	480	20,000	124,000	666	4,133.
4	Fld army topo bn	(Based on 160-km width) 1 set fld army zone/sector.	480	10,000	62,000	333	2,066.
5	Fld army G2 (imagery intpr sec)	(Based on 160-km width) 1 set fld army zone/sector.	480	10,000	62,000	333	2,066.
6	Corps G2 (imagery intpr sec)	(Based on 55-km width) 1 set corps zone/sector.	160	1,200 each corps.	7,175 each corps.	40 each corps.	240 each corps.
7	Corps topo co	(Based on 55-km width) 1 set corps zone/sector.	160	1,200 each corps.	7,175 each corps	40 each corps.	240 each corps.
8	Corps arty (imagery intpr sec)	(Based on 55-km width) 1 set corps zone/sector.	160	1,200 each corps arty.	7,175 each corps arty.	40 each corps arty.	240 each corps arty.
9	Div G2 (imagery intpr sec)	(Based on 15-km width) 2 sets division zone/sector.	80	400 each div.	2,110 each div.	17 each div.	140 each div.
10	Div arty (imagery intpr sec)*	(Based on 15-km width) 1 set division zone/sector.	80	200 each div arty.	1,055 each div arty.	7 each div arty.	70 each div arty.

*Attached to division from MI battalion, field army.

Table 3–7. Total Airphotographic Requirements for a Field Army

1	Area	Coverage (scale 1:10,000)			
		Basic[1]		Tactical[2] (depth 25 km)	
		Photographs	Wt/lb	Photographs	Wt/lb
2	Field army zone/sector (based on 160-km width).	Depth 160 km 21,600	728	1,600	96
3	Corps zone/sector (based on 60-km width).	Depth 80 km 3,640	255	480	34
4	Division zone/sector (based on 15-km width).	Depth 40 km 1,560	108	160	11

[1] Based on issue table 3–6 above.
[2] Per set of photographs.

Table 3–8. Reproduction Section, MI Detachment, Air Reconnaissance Support, Field Army (TOE 30–7G)

1	Remarks	Format sizes	Capabilities
2	Section reproduces and identifies air imagery obtained from tactical air force reconnaissance elements.	4½- by 4½-, 4½- by 10⅔-, 9- by 9-, and 9- by 18-inch photographic imagery.	Reproduction of duplicate positive, duplicate negative, and photographic prints of air imagery either by selected frame or continuous strips of all format sizes. Enlargement capability of 2 to 1 of 4½- by 4½-inch imagery. Packaging and identification of reproduced imagery for delivery.

Table 3–9. Imagery Interpretation Section, MI Detachment, Air Reconnaissance Support, Field Army (TOE 30–7G)

1	Remarks	Capabilities
2	Prepares imagery interpretation reports, mosaics, and other interpretation of air imagery for the field army as required.	Plots and performs immediate interpretation of air IR, radar, and photographic imagery. Prepares and disseminates imagery interpretation reports on this imagery. Provides liaison with reconnaissance elements of the tactical air force that provides support to the field army; briefs and debriefs Air Force pilots to secure information obtained from visual sightings.

Table 3–10. Air Force Photographic Units

1	Unit	Photographs furnished	Remarks
2	Reconnaissance wing (theater of operations).	Specialized photography needed by topographic units for photogrammetry and photography for strategic purposes beyond the scope of reconnaissance wings of tactical air commands and tactical air forces.	Wing may include mapping and charting squadrons. Mapping photography ordinarily not suitable for intelligence purposes because of small scale and lack of detail. May contain important information, however, and prints should be made available to MI officers for study.
3	Reconnaissance wings of tactical air commands and tactical air forces.	Photographs needed for intelligence or combat purposes (single photographs, vertical and oblique; stereopairs; or night photographs).	Also visual reconnaissance missions are capable of providing limited vertical and oblique photographs. Photographic missions capable of large quantities of high-altitude vertical and oblique photographs and, under extremely urgent circumstances, limited and low-altitude vertical and oblique photographs.

Section IV. EXPRESSING TIME, DATES, AND NATURAL PHENOMENA

3-15. Time and Dates

a. Time. Time is expressed in a group of four digits, ranging from 0000 to 2400. The first two digits are the hours after midnight, and the remaining two digits indicate the minutes past the hour. When the hour can be expressed by a single digit, it is preceded by zero (0); for example, 0625 for 6:25 a.m. Correct official time is available at the nearest signal center.

b. Dates.

(1) The day, month, and year are expressed in that order, except when it is necessary to specify a six-digit time group and then the following order is used: the first two digits indicate the day of the month, the next two digits indicate the hour, and the last two digits indicate minutes past the hour.

Example: 070625 Dec 67 (6:25 a.m. 7 Dec 67). The day is expressed by numerals; the month is either spelled out or abbreviated. Abbreviations, if used, consist of the first three letters of the word. The year is expressed by four digits or by the last two digits.

Example: 14 January 1968; 14 Jan 1968; 14 Jan 68.

(2) When it is desired to keep dates secret, they may be expressed by a letter such as D plus or minus a numeral.

c. Greenwich Civil Time. Communications between headquarters in different time zones are usually dated, and references to dates and times are usually made in Greenwich civil time. The standard time at Greenwich, England, is accepted as the basis for measuring time throughout the world. Local civil time can be changed to Greenwich civil time by adding or subtracting the appropriate number of hours as indicated in the time zone chart in figure 3-2. Greenwich civil time can be changed to local civil time by reversing the signs of the time zone chart. Appropriate adjustments must be made for daylight saving time and war time.

d. Time Suffixes. Time groups expressing Greenwich civil time are designated by the letter suffix Z immediately following the last digit of the group. For example, 190225Z indicates 2:25 a.m. on the 19th of the current month, Greenwich civil time. Any other suffix used after a four-digit time group (corresponding to the Z of Greenwich civil time) indicates the zone in which the local civil time is expressed. *It does not designate location on the earth's surface.* The proper suffix can be determined from the time zone chart and the time conversion chart in figures 3-2 and 3-3, respectively. For example, Kansas City is located in the sixth time zone west of Greenwich. If Kansas City keeps local civil time, the time group suffix will be S.

3-16. Natural Phenomena

a. General. Staff officers avoid the use of such indefinite terms as "first light," "last light," "daybreak," "daylight," "dusk," and "dawn." Terms of a definite nature, such as "beginning" or "ending of evening" or "morning nautical" or "civil twilight," are permissible. However, expressions of these times to lower units must be in clock time. "First light" and "last light," terms used by the armed forces of the United Kingdom, include a slightly greater period of twilight than defined by civil twilight.

b. Published Data. For purposes of military planning and to facilitate staff work in expressing natural phenomena in time, theater commanders prepare and publish for the theater as a whole or for major geographic portions thereof daily time, sunrise, sunset, twilight, moon, and tide tables and specify the number of hours the local time differs from Greenwich civil time. A sample of the type of chart that should be prepared and issued for each major operation or operational area is shown in figure 3-4. These data are available through Army channels. Data on time of sunrise, sunset, morning and evening twilight, and moon phases can also be found in TM 5-236-series (current year).

(1) *Datum.* The astronomical data are for sea level and will not vary more than 5 minutes for each degree of the difference in longitude from the standard meridian.

(2) *Time used.* The times on the diagram are for the time meridian indicated in the heading. When another time meridian is to be used in the field, it will be found convenient to change the figures representing hours on the left of the large diagram to conform to the new time. If the time meridian to be used is east of the one shown on the

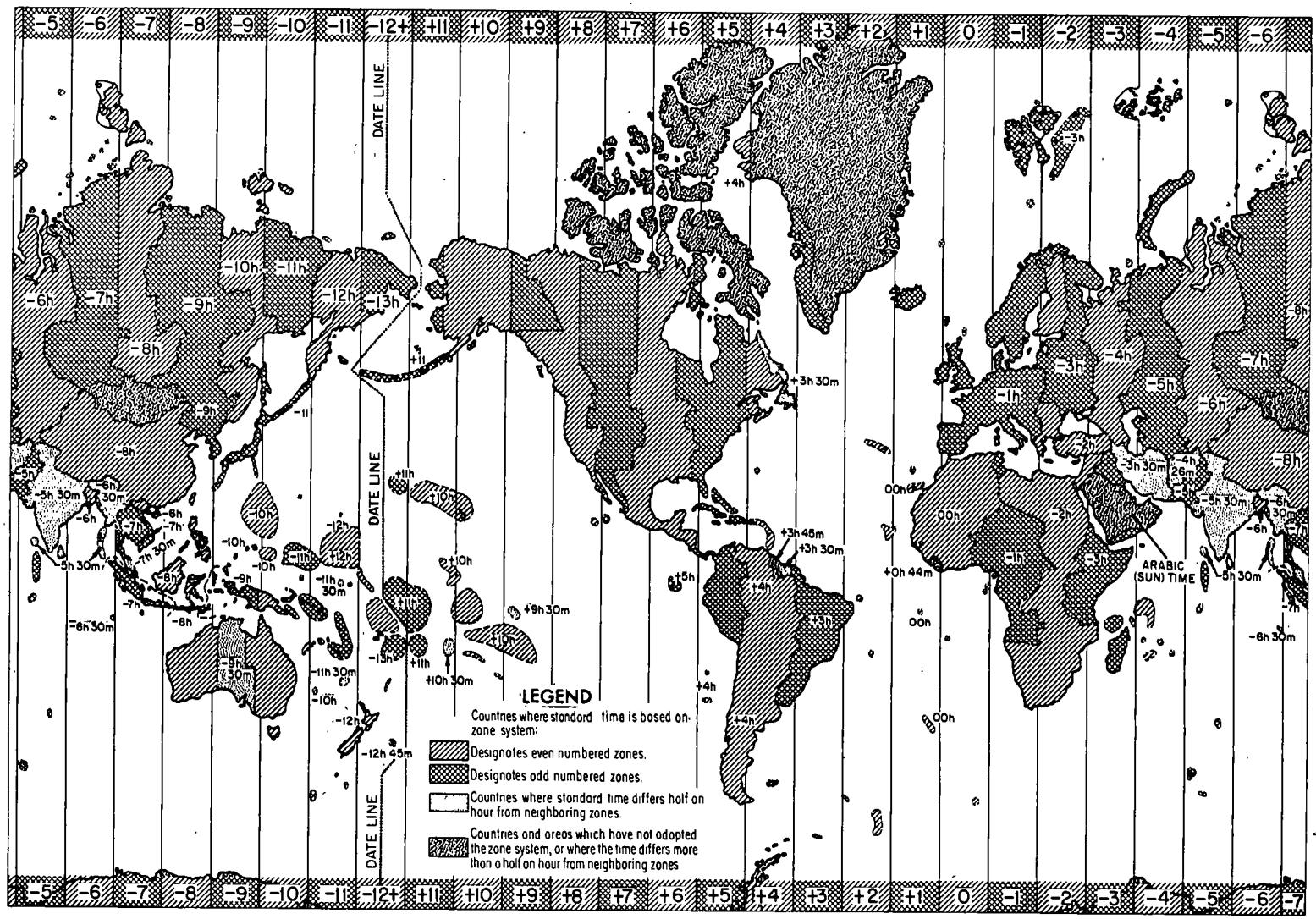

Figure 3-2. Time zone chart.

Previous day																										Same day
	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	
	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	
	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	
	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	
	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	
	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	
Same day	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	Next day
	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	
	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	
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	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	
	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	
	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	
	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	
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	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	
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	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	
	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	
	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	
	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	
	Y +12	X +11	W +10	V +9	U +8	T +7	S +6	R +5	Q +4	P +3	O +2	N +1	Z 0	A −1	B −2	C −3	D −4	E −5	F −6	G −7	H −8	I −9	K −10	L −11	M −12	

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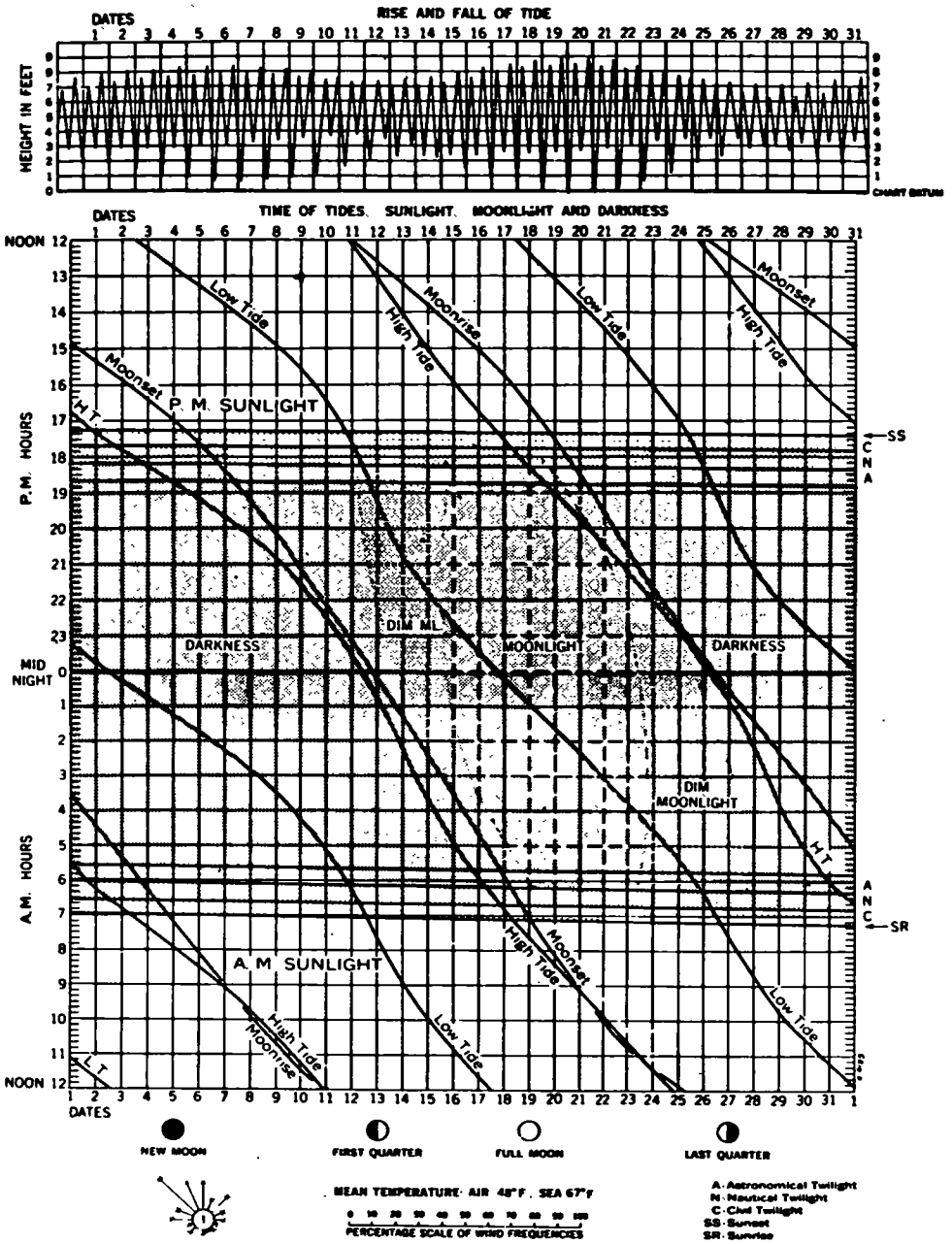
Figure 3-3. Time zone conversion chart.

KAGOSHIMA—WAN, KYUSHU * DECEMBER 1945
Lat 31° 30′ N., Long 130° 40′ E. Time Meridian: 135° E.
Sunlight and Moonlight Data Computed for Lat 31° 30′ N., Long 130° 40′ E.



*This diagram, with the changes indicated, is also applicable to the following places:
TOMARI URA.—Add 10 minutes to times of high and low tides, subtract ½ foot from heights of high tides.
ODOMARI WAN.—Subtract 25 minutes from times of high and low tides, subtract 1 foot from heights of high tides.

Figure 3-4. Diagram of tides, sunlight, and moonlight.

diagram, increase the figures by 1 hour for each 15°; if west, decrease the figures.

(3) *Dates.* In the upper diagram each day from midnight to midnight is represented by a space between two lines. In the lower diagram the days are represented by vertical lines covering the period from noon of one day to noon of the next. The dates at the bottom of the diagram differ from those at the top because the date changes in passing through midnight.

(4) *Tides.* The times of the high and low tides are shown by curves in the lower graph of the diagram in figure 3–4. By noting the sequence of the tides during a day, the height of any particular tide can be found from the upper graph of this diagram.

(5) *Moonlight.* For astronomical twilight and solar darkness, periods of moonlight and dim moonlight are shown on the lower diagram. During the period of moonlight, the intensity of light varies between the brightness of the full moon at zenith and one-third of this value. During the period of dim moonlight, the intensity varies from one-third to one-tenth of the brightness of full moon at zenith.

(6) *Moon's phases.* The phases of the moon are shown below the day on which they occur.

c. Twilights (fig. 3–5).

(1) Twilights are the periods of solar illumination before sunrise and after sunset. Both morning and evening twilights are divided into three periods: astronomical, nautical, and civil. The interval between the instant the upper edge of the sun's disk appears on the horizon and the instant the center of the sun is 6° below the horizon is civil twilight, 6°—12° nautical twilight, and 12°—18° astronomical twilight.

(2) Astronomical twilight affords such meager, if any, light that for military purposes it may be considered a period of darkness.

(3) Nautical twilight provides enough illumination to carry on most types of ground movement without difficulty and approaches conditions expected under full light of day. Vision is limited to 365 meters or less. For military purposes, during the nautical twilight periods weapons can be employed within the range of vision stated and daylight calculations relative to movement will apply, including restrictions on such movement. Bomb loading and repair work cannot be carried on without the use of artificial light.

(4) Civil twilight affords sufficient light to carry on normal day activities. This period is the earliest or latest that provides sufficient natural illumination of targets to allow efficient observed artillery fire or day bombing.

(5) Except for high latitudes, values for the approximate durations of astronomical, nautical, and civil twilights may be considered equal.

d. Effect of Weather on Light. Weather has been disregarded in the above considerations. Smudge, fog, clouds, refraction, reflection, and precipitation affect the degree of illumination. These factors can be included in the calculations by experience tables compiled in the area over a period of time and from meteorological forecasts for the area only.

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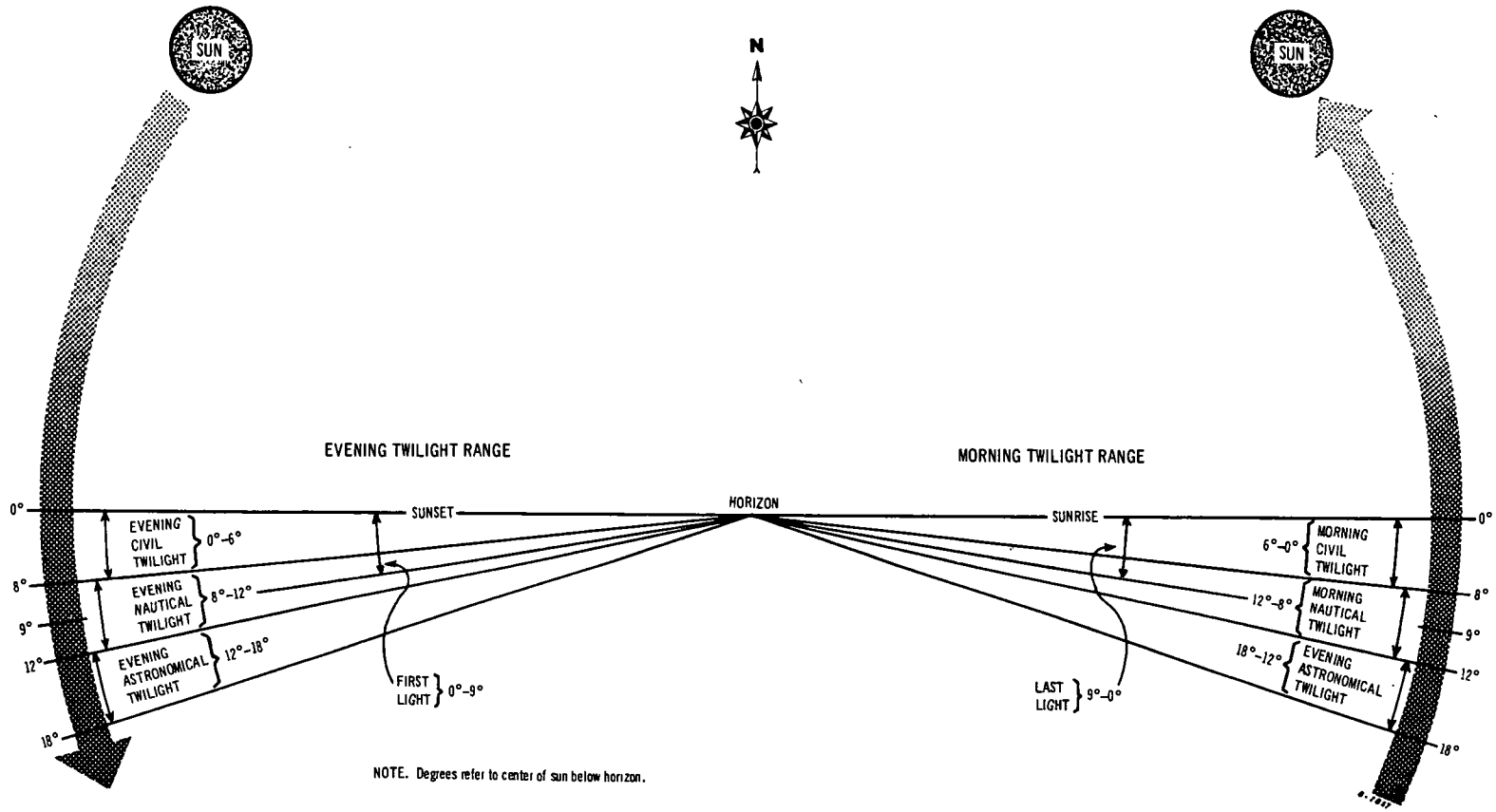


Figure 3–5. Twilight factors.

Section V. THE WORLD GEOGRAPHIC REFERENCE SYSTEM

3–17. General

a. The World Geographic Reference System (GEOREF) is used in all joint air defense operations. Army air defense uses the GEOREF on early warning plotting boards and on plan position indicator (PPI) screens and for reporting installation locations and target positions.

b. The GEOREF is a worldwide position reference system that may be applied to maps or charts graduated in latitude and longitude regardless of projection. It is a method of expressing latitude and longitude suitable for rapid reporting and plotting.

c. Mobile air defense units are required to report to higher headquarters any new position occupied in GEOREF coordinates.

3–18. The GEOREF Identification Code

a. The GEOREF system uses an identification code that is divided into three main divisions. The GEOREF designations are read by the same rule as military coordinates: right, then up. The complete GEOREF coordinate is expressed by combining the identification letters for the first and second divisions with the numbers identifying the third division.

b. In a GEOREF coordinate designation, the first pair of letters identifies the first division, 15° quadrangles, within which a point is located. The first division (15° quadrangles) is subdivided into the second division, 1° quadrangles, which are identified by the second pair of letters. The second division (1° quadrangles) is further subdivided into the third division, 1′ quadrangles, which are identified by a pair of two-digit numerals.

c. The first division quadrangles are constructed by dividing the surface of the earth into 24 longitudinal zones of 15° each and 12 lateral bands of 15° each. The 24 longitudinal zones, identified by the first letter of a GEOREF designation, are lettered A through Z (omitting I and O) eastward from the 180th meridian. The 12 bands of latitude, identified by the second letter, are lettered A through M (omitting I) northward from the South Pole.

d. The second division quadrangles are constructed by subdividing each of the 15° quadrangles into 15 longitudinal zones of 1° east and west and 15 latitudinal bands of 1° north and south. The longitudinal zones, identified by the third letter of a GEOREF designation, are lettered west to east from A through Q (omitting I and O). Similarly, the latitudinal bands identified by the fourth letter, are lettered south to north from A through Q (omitting I and O).

e. The third division quadrangles are constructed by subdividing each of the 1° quadrangles into 60 longitudinal zones of 1′ east and west and 60 latitudinal bands of 1′ north and south. The longitudinal zones, identified by the first pair of digits of the numerical portion of the GEOREF designation, are numbered west to east from 00 through 59. The latitudinal bands, identified by a second pair of numerals, are numbered south to north from 00 through 59. The numerical designation of the third division of the GEOREF expresses the location in minutes for points located north in latitude or east in longitude. For points located south in latitude or west in longitude, the location in minutes is rounded to the next higher minute, subtracted from 60, and recorded as the third division of the GEOREF.

f. The manner of lettering and numbering does not vary whether the location is west or east of the prime meridian or north or south of the Equator. A third division quadrangle encompasses an area approximately 1 nautical mile at the Equator to zero at the poles.

g. Example: The geographic coordinates of El Paso, Texas, are 31°48′06″ N and 106°25′48″ W. These coordinates are rounded off to 31°48′ N and 106°26′ W. The first division (15° quadrangle) is identified by the letters EJ; the second division (1° quadrangle) is identified by the letters PB; the third division is derived by subtracting 26 from 60 to record 34 for the GEOREF designation of the longitudinal zone, west longitude, and 48 for the latitudinal band, north latitude. Thus, the complete GEOREF coordinates are expressed EJPB3448. FM 44–1 contains a more detailed description of this system.

CHAPTER 4

OPERATIONS

Section I. TROOP PLANNING

4-1. Introduction

a. General. The mission; the character, disposition, and capabilities of the enemy; characteristics of the area of operations (to include terrain, climate, population, natural resources, and manmade works; the availability of troops or units or both; and the availability of transportation, supplies, and equipment determine the numbers and types of units for employment in a given operation.

b. Basic Steps in Troop Requirement Planning.

(1) The following general steps are essential in accomplishing sound troop requirement planning:

(*a*) Determination of the functions or tasks to be performed.

(*b*) Determination of quantitative workload.

(*c*) Selection of type of operating unit, with capability required.

(*d*) Calculation of number of operating units required.

(*e*) Provision for command and control.

(2) Accomplishment of the steps listed in (1) above requires each member of the staff, in light of his responsibilities and the factors that affect mission accomplishment, to study the overall mission in detail.

c. Planning Procedures. Troop requirement planning passes through three phases—estimation, calculation, and modification. The planner must accomplish the first phase, particularly in the case of the establishment of a new theater with few, if any, tangible figures. He develops each successive phase with more concrete and accurate data than available in the preceding phase until a balanced, sound troop list evolves.

(1) *Phase I planning—estimation.* The planner must accomplish the initial step in the development of troop requirements with little specific data—often he has no more than a brief statement of the overall strength of the force to be employed or the number of divisions around which the force is to be built. Each planner uses broad experience factors, such as division and air wing slices, troop and equipment densities, and replacement and consumption factors. For example, when the total troop strength is unknown, the planner can estimate by using appropriate division and air wing slices. From this figure, and from basic vehicle density factors, he can estimate the number of vehicles in the force. The planner derives other data in a similar fashion. The margin of error will depend to a great extent on the accuracy of the factors he uses. He should use factors representing the best available experience and refrain from changing factor values unless he has the experience and background to make such changes valid.

(2) *Phase II planning—calculation.*

(*a*) Phase II planning begins when the planner receives phase I estimates in the form of initial, tentative troop lists. He can derive troop strengths and equipment lists for the force from these initial lists, which should be more accurate than the estimates used to initiate planning in phase I. The margin of error between these initial lists and those finally accepted will depend not only on the adequacy of the planning factors and guidance available to the troop requirement planners, but also on the experience, aptitude, and judgment of the individual planner. At the review level, general staff troop planning officers should carefully examine lists of the arms and services to determine whether the lists comply with guidance provided in the campaign plan scenario. In cases where branch strength requirements are largely dependent on total force strength, these planners should question any significant deviation from currently accepted

percentages. However, environmental conditions, cultural development, and periods of time available for the buildup, to include force deployment and base development, are seldom identical in different campaign scenarios. Certain types of troop strength requirements are highly sensitive to factors other than total force in the theater. For example, a given campaign plan scenario indicates that peak requirements for logistic support of operations will occur at a particular phase of the campaign, e.g., on initiation of the offensive at D+90 days. It is assumed that the airfields; roads; ports; terminals; and storage, maintenance, and other facilities needed to maintain the planned volume of logistic support will require approximately 12 construction battalion (CB) months to accomplish. If work were to start on D-day, four engineer CB could do the work if they are in the theater. However, if the battalions were scheduled for deployment into the theater at 10-day intervals starting at D+10 days, the task would require eight engineer CB.

(*b*) When the consolidated initial troop list is available, each planner reviews the list and decides, based on the new information from the consolidated list, whether his next revision will increase or decrease and to what extent. The general staff planning officer should appraise the predictions of each planner for accuracy and recalculate the first revised troop list accordingly. The general staff planning officers then furnish this information to all other planners so that each will be aware of the direction and limits of applicable changes.

(*c*) When this information is available, the planners continue phase II planning by preparing revised estimates. They discard the division slice and other factors suitable only for initial estimation in favor of actual (or adjusted) figures extracted from the initial lists. They may make several revisions before they can balance lists with one another. Intelligent adjustment and careful prediction at each successive planning stage reduce the number of revisions necessary to arrive at a calculated, balanced troop list to complete phase II.

(3) *Phase III planning—modification.*

(*a*) The consolidated troop list produced in phase II provides a balanced force, each element of which is capable of performing its mission without modification. The planner applies the modifications, adaptations, or alterations that policy, command direction, or conditions peculiar to the theater under consideration dictate in phase III if he has not already considered them in phase I or phase II.

(*b*) The planner should substitute indigenous labor for military personnel at this stage. At the same time he should prepare lists of class IV equipment for the use of the indigenous labor forces.

(*c*) The substitution of indigenous labor for military personnel will immediately throw the troop list out of balance, and it may require several successive revisions such as those made in phase II to restore it to balance. This substitution will affect various services differently. For example, the impact on maintenance units will be relatively minor because the equipment density will not change significantly; but the impact on the medical troop list will be substantial because medical service is provided primarily on the basis of military strength. Other services will notice greater or lesser extent depending on the change in military strength and equipment required.

(*d*) Because substitution of indigenous labor for military personnel in phase III will cause an imbalance and make additional revisions necessary, the planner should consider making the substitution earlier in the planning. This substitution will simplify matters for services, such as medical, interested primarily in military strengths; but it will complicate matters for those services that must prepare lists of class IV equipment for the indigenous labor force. If the planner outlines the labor force concurrently with the military forces, he must include the class IV equipment lists in each step and revise them accordingly. This procedure complicates and delays the steps in planning for all services and may introduce greater margins for error in each step. The chief of the planning group decides the procedures to follow; but the various combat service support representatives should present the advantages and disadvantages of each method and make an appropriate recommendation in each case. The establishment of 100-percent military troop lists against which planners can make augmentations and comparisons is desirable.

(*e*) Planners frequently impose arbitrary personnel ceilings on the combat service support elements. Planners should not apply these ceilings until phase III because the reduction in strength may not be proportional for all services or for all units within a service. If the planner knows the full military strength required to accomplish a mission, he can adequately appraise the effects of a reduced strength and report them to the head of the planning staff and force commander.

(*f*) The planner makes final distribution of troops by zone or area and determines and locates depots and other major installations in phase III. If the planner has tentatively done the foregoing for each troop list prepared in phases I and II, he should find the final determination simple because he has become increasingly aware of the deployment of troops of other arms and services throughout the theater and has progressively adjusted his own distribution to meet the probable load.

4–2. Troop Requirements, Typical Field Army

a. Tables 4–1 through 4–5 indicate the numbers and types of units that might be found in a dual-capable (capable of fighting in nuclear or nonnuclear environment), typical field army operating under conditions of general war. This typical field army has three corps of one infantry division, one armored division, and two infantry (mechanized) divisions each. Table of organization and equipment (TOE) designations shown are current approved types or those the Department of the Army has officially designated as proposed or tentative. Emphatically, the tables purport only to illustrate the many and various types of nondivisional units that a commander may employ in the field and the principles of organization of these units. The tables do *not* attempt to depict an organization for the conduct of operations in a specific situation or to connote in any way that they compose a typical force in the field. Actually, the composition or size of forces in the field army will depend on the assigned missions and the requirements of locale and forms of conflict. Tables 4–1 through 4–5 cover the force enumerated in this paragraph.

b. FM 101–10–3, chapter 4, gives troop requirement planning factors for a large theater of operations.

Table 4–1. Command and Control Units, Field Army

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld Army	7 Total fld army
2	HHC, spt gp	29–102G	143	(2)	8		8
3	HHC, army	51–1G	663			1	1
4	HHC, corps	52–1T	247	1			3
5	HQ and sp trp, FASCOM	54–12T	392		1		1
6	HHC, spt bde, army	54–22T	204		1		1
7	HHC, spt, bde, corps	54–22T	204	(1)	3		3

Note. Numbers in parentheses indicate areas where any or all units are employed. They are part of the totals in the other columns.

Table 4–2. Divisions

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
2	Inf div (typical div)	7G	*17, 568	1			3
3	Armd div (typical div)	17G	*18, 021	1			3
4	Inf div (mech) (typical div)	37G	*17, 994	2			6
5	Abn div	57G	13, 449				
6	Airmbl div (typical div)	67T	16, 614				

*Strength when equipped with MAB. Strength increased by 2 when engineers are equipped with MT46 bridging.

Table 4–3. Combat Units

1	Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	Sep bde base						
2	Sep inf bde	7–100G	[a] 2, 196				
3	Sep armd bde	17–100G	[a] 2, 189				
4	Sep inf bde (mech)	37–100G	[a] 2, 189	1			3
	Inf units						
5	Inf bn, sep inf bde	7–15G	849	2			6
6	Inf bn (mech), sep bde	7–45G	924				
7	Inf LRP co	7–157G	216	1			3
8	Inf sct dog plat	7–167G	28	1			3
9	Inf pfdr det, abn	7–168G	15	2	2		8
	Armor units						
10	Sep tk bn, abn	17–15T	581				
11	Tk bn, sep bde	17–35G	599	2			6
12	Armd cav regt	17–51G	3, 483	1		1	4

[a] Bde base strength only.

Table 4–4. Combat Support Units

1	Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	FA units						
2	HHB, FA gp	6–401G	135	4			12
3	FA bn, 155-mm, towed	6–425G	563	2			6
4	FA bn, 175-mm, SP	6–435G	550	4			12
5	FA bn, 8-in., SP	6–445G	618	6			18
6	FA bn, 155-mm, SP	6–455G	506	4			12
7	FA scty tm (FA, FB)	6–500G	40	1			3
8	FA scty tm (FC)	6–500G	20			1	1
9	HHB, corps arty	6–501G	211	1			3
10	FA bn, HJ	6–525G	408	2			6
11	FA bn, SGT	6–555G	377	1			3
12	FA btry, slt	6–558G	154	1			3
13	FATAB	6–575G	768	1			3
14	FA bn, PERSH	6–615G	1, 144			1	1
	ADA units						
15	HHB, ADA bde	44–2G	79			1	1
16	ADA tgt det	44–8G	16			1	1
17	HHB, ADA gp	44–12G	79	1		2	5
18	ADA AW bn, SP	44–85G	718	1		3	6
19	ADA bn, HAWK (mbl)	44–235G	827	4		4	16
20	ADA bn, HERC	44–535G	922			6	6
21	ADA bn, CHAPARRAL/VULCAN	44–725T	750			6	6
	Avn units						
22	Avn co (airmbl)	1–77G	189	4			12
23	Aerial wpn co	1–111T	200	2			6
24	Corps avn co	1–127D	163	1			3
25	Avn aerial survl co	1–128T	297	1			3
26	AAVN co	1–137D	165			1	1
27	Avn ATC co	1–207E	222			1	1
28	HHC, avn bn	1–256G	77	1	1		4

Table 4-4. Combat Support Units—Continued

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	Cml units						
29	HHD, cml gp	3-32G	49			1	1
30	HHD, cml smoke genr bn	3-266G	29	1		1	4
31	Cml smoke genr co	3-267G	147	4		4	16
32	Cml det, CBR cen (JA)	3-500E	5	6		2	20
	Engr units						
33	Engr cbt bn, army or corps	5-35G	836	8		12	36
34	HHC, engr cbt gp	5-52G	114	2		3	9
35	Engr aslt brg co	5-64G	205	2			6
36	Engr pnl brg co	5-77G	129	2		3	9
37	Engr fltbrg co	5-78G	234	3		6	15
38	Engr cam co	5-97G	74	1			3
39	HHC, engr cbt bde, army	5-101G	146			1	1
40	HHC, engr cbt bde, corps	5-101G	118	1			3
41	Engr dptrk co	5-124G	114	2		3	9
42	Engr topo bn, army	5-305G	368			1	1
43	Engr topo co, corps	5-327G	143	1			3
44	HHC, engr amph bde	5-401G	111	1			3
45	HHC, engr amph gp	5-402G	90	1			3
46	Engr amph bn	5-405G	716	1			3
47	Engr map distr plat (ID)	5-540G	38	1			3
48	Engr geod surv tm (IE)	5-540G	20			1	1
49	Engr terrain tm (IF)	5-540G	13			1	1
50	Engr topo planning and con tm (IG)	5-540G	20			1	1
51	Engr photo eval tm (IH)	5-540G	8			1	1
52	Engr mil hydrology tm (IL)	5-540G	22			1	1
53	Engr team (ADM) (MA, MB, 4MC)	5-570G	27	2		1	7
	MI units						
54	MI bn, air recon spt, fld army	30-5G	281			1	1
55	MID, sep bde	30-14G	32	1			3
56	MID, armd cav regt	30-14G	32	1		1	4
57	MID Co, div	30-17G	85	4			12
58	MID, corps	30-18G	72	1			3
59	MI bn, fld army	30-25G	752			1	1
60	MI bn HQ (AD)	30-600G	37	1			3
61	MI gp HQ (AE)	30-600G	48			1	1
	Army Security Agency (ASA) units						
62	HHC, ASA gp, fld army	32-52D	257			1	1
63	HHC, ASA bn (corps)	32-56F	181	1			3
64	ASA div spt co (inf)	32-57F	347	4			12
65	ASA op co	32-67E	236			2	2
66	ASA proc co	32-77D	33			1	1
67	ASA scty co	32-78D	231			1	1
	Sig units						
68	Corps sig bn	11-15D	691	1			3
69	Sig cable CB	11-45E	892			1	1
70	Sig cbt area bn	11-85E	815			6	6
71	Army comd sig op bn	11-95G	1, 113			1	1
72	Sig op co, mdm HQ	11-127E	207		1		1

Table 4–4. Combat Support Units—Continued

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	Sig Units—Continued						
73	Sig small HQ op co	11–147G	126	(1)	(4)	(1)	4
74	Crypto spt tm, type B (NB)	11–500D	20	4			12
75	Crypto spt tm, type C (NC)	11–500D	29			1	1
76	Trans multiplex fac tm (RF)	11–500D	28			1	1
77	Sig det, ADA sys comm (ADA gp) (RT)	11–500D	49	1		2	5
78	Sig det, ADA sys comm (ADA bn) (RU)	11–500D	36	1		10	13
79	ADPS cen (large) (TE)	11–500D	34			1	1
80	ADPS cen (mdm) (TF)	11–500D	25	2		2	8
81	ADPS cen (small) (TG)	11–500D	12	2			6
	PSYOP units						
82	PSYOP bn (AB, BA, GA, GB, GC, GD, FA, FB, FC, FD, FE).	33–500G	*97			1	1
83	PSYOP co (AA, HA, 2HB, HC, HD)	33–500G	*27	(1)		3	3

*Indicates base strength. Total strength depends on number of teams used.

Table 4–5. Combat Service Support Units (Field Army Support Command)

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	Ammo units						
2	HHC, ammo DS/GS gp	9–22H	102	(1)	3		3
3	HHC, ammo DS/GS bn	9–36G	108	(2)	6		6
4	Ammo co, convl	9–38G	315	(6)	18		18
5	Ord sp ammo DS co	9–47G	196	(2)	6		6
6	Sp ammo GS co	9–48G	175	(1)	3		3
7	GM GS maint co	9–59G	202	(1)	3		3
8	Msl DS spt det	9–550T	61	(2)	6		6
9	EOD det (GA)	9–520G	13	(3)	9		9
10	EOD det, con (GB)	9–520G	11	(1)	3		3
11	PERSH GS maint co	9–577G	167		1		1
	Maint units						
12	Ord tire rep co	9–117G	160		1		1
13	Le GS maint co, army	29–134G	276	(2)	9		9
14	HHD, maint DS or GS bn, army	29–136G	63	(6)	26		26
15	Hv equip GS maint co, army	29–137G	303	(6)	24		24
16	Coll, clas, and salv co	29–139F	226	(1)	4		4
17	Lt maint DS co	29–207F	154	(12)	48		48
18	Maint spt co, DS	29–208G	302	(4)	16		16
19	Maint mgt det, FASCOM	29–403T	19		1		1
20	Maint mgt det, spt bde	29–403T	29	(1)	4		4
21	HHC, trans acft maint and sup GS bn	55–66F	64		2		2
22	HHD, acft maint GS bn	55–456G	60		2		2
23	Trans acft DS co	55–457G	265	(4)	16		16
24	Trans acft maint GS co	55–458G	290	(4)	16		16

Table 4–5. Combat Service Support Units (Field Army Support Command)—Continued

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	Med units						
25	Med holding co	8–57E	90		3		3
26	HHD, med bge	8–112G	71		1		1
27	HHD, med gp	8–122G	37		6		6
28	Cbt, spt hosp	8–123T	215	1			3
29	HHD, med bn	8–126G	39		9		9
30	Med amb co	8–127G	102		15		15
31	Med clr co	8–128G	130		15		15
32	Med coll co	8–129G	191		3		3
33	Med air amb co	8–137G	201		3		3
34	Med co, sep bde	8–147G	132	1			3
35	PVNTMED svc unit, fld	8–204E	114		1		1
36	Co HQ (AC)	8–500G	8		4		4
37	HQ, vet prof svc (AF)	8–500G	4		1		1
38	Prof svc det (AG)	8–500G	15		3		3
39	HQ, den prof svc (AI)	8–500G	4		5		5
40	Vet small animal hosp det (ID)	8–500G	15		1		1
41	Vet svc det, small (JA)	8–500G	6		3		3
42	Vet svc det, large (JB)	8–500G	54		1		1
43	Surgical det (KA)	8–500G	7		6		6
44	Ortho det (KB)	8–500G	7		6		6
45	Shock det (KC)	8–500G	4		3		3
46	Maxillofacial det (KD)	8–500G	7		3		3
47	Neurosurgical det (KE)	8–500G	7		6		6
48	Thoracic det (KF)	8–500G	7		3		3
49	Med trmt det, cml agts (KG)	8–500G	14		3		3
50	X-ray det (KH)	8–500G	3		1		1
51	Den op det (KI)	8–500G	2		10		10
52	Den svc det (KJ)	8–500G	37		28		28
53	Den prosthetic det, mbl (KK)	8–500G	4		14		14
54	Med det, psychiatric (KO)	8–500G	19		3		3
55	Blood distr det (NC)	8–500G	8		1		1
56	Med det (OA)	8–500G	9		30		30
57	Med intel det (QA)	8–500G	12		3		3
58	Med det, hel amb (RA)	8–500G	48		12		12
59	Med det, air crash rsq (RC)	8–500G	16		18		18
60	Med det, air crash rsq (RD)	8–500G	7		12		12
61	MASH	8–571E	91		12		12
62	Evac hosp	8–581E	229		24		24
63	Conv cen	8–590E	242		1		1
64	Med lab	8–650E	111		1		1
65	Army med dep	8–667E	198		1		1
	MP units						
66	HHD, MP bn	19–76G	59	(1)	5		5
67	MP ESCRG co	19–47G	140		2		2
68	MP co	19–77G	186	(4)	22		22
69	MP phys scty co	19–97G	143	(1)	3		3
70	MP gd co	19–247E	123		2		2
71	HHD, MP bde	19–262G	61		1		1
72	HHD, MP bn (AD)	19–500E	21		1		1
73	MP det, hosp scty (2FD, 7IC, IG)	19–500E	38		1		1
74	MP det, crim inves (LA)	19–500E	4	(1)	3		3
75	MP det, crim inves (LC)	19–500E	27		1		1
76	MP det (MC)	19–500E	26		1		1

Table 4–5. Combat Service Support Units (Field Army Support Command)—Continued

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	S &S units						
77	Fftg tm (FA, FB, FC, 3FD)	5–510G	18	(2)	8	--------	8
78	Gas genr tm (GF)	5–520G	27	--------	1	--------	1
79	CO^2 genr tm (GG)	5–520G	13	--------	1	--------	1
80	Util tm (HC)	5–530G	31	(2)	6	--------	6
81	Util tm (HD)	5–530G	52	--------	2	--------	2
82	Util tm (HH)	5–530G	16	--------	1	--------	1
83	HHC, Petrl sup bn	10–226G	82	(1)	4	--------	4
84	Petrl sup co	10–227G	305	(1)	6	--------	6
85	QM air dlvr co	10–407H	278	--------	1	--------	1
86	Sales det, mbl (7BA, BB, BC)	10–500G	34	(1)	4	--------	4
87	Fld svc GS co fwd	29–114H	230	(4)	12	--------	12
88	Gen sup GS co	29–118H	264	(4)	16	--------	16
89	Rep parts GS co, fwd, corps	29–119H	279	(2)	6	--------	6
90	Rep parts GS co, army	29–119H	304	--------	4	--------	4
91	Fld svc GS co, army	29–124H	333	--------	2	--------	2
92	Hv mat sup GS co	29–127H	206	--------	3	--------	3
93	Acft and msl rep parts sup co	29–129G	274	--------	3	--------	2
94	HHC, sup and svc bn	29–146G	98	(2)	12	--------	12
95	S&S DS co	29–147G	303	(2)	16	--------	16
96	Invt con co, FASCOM	29–402T	363	----------	----------	----------	1
97	Stk con co, spt bde	29–404T	187	(1)	4	--------	4
	Trans units						
98	HHC, avn bn	1–256G	77	2	2	--------	8
99	Avn mdm hel co	1–258G	239	4	4	--------	16
100	Avn hv hel co	1–259G	129	--------	1	--------	1
101	HHD, trans MCC	55–6F	166	----------	----------	----------	----------
102	Trans mumt con co (FASCOM)	55–6G	106	--------	1	--------	1
103	Trans mumt con co (SptBde)	55–7G	79	(1)	3	--------	3
104	HHD, TMT bn	55–16G	43	(1)	5	--------	5
105	Trans lt trk co (2 1/2-ton)	55–17G	175	--------	2	--------	2
106	Trans lt trk co (5-ton)	55–17G	179	(1)	3	--------	3
107	Trans mdm trk co (cgo)	55–18G	183	--------	4	--------	4
108	Trans mdm trk co (petrl)	55–18G	183	--------	15	--------	15
109	Trans car co, army	55–19E	107	(1)	4	--------	4
110	Trans hv trk co	55–28G	155	(1)	5	--------	5
111	Trans tac carr co	55–47T	215	1	----------	----------	3
112	HHC, trans bde	55–62F	105	--------	1	--------	1
113	Trans lt-mdm trk co	55–67G	202	(6)	24	--------	24
114	Trans acft maint co	55–89G	107	--------	1	--------	1
115	Trans tml trf co	55–118G	266	--------	3	--------	3
	Pers svc units						
116	SPS det (AB, 4FA)	12–18G	42	(2)	8	--------	8
117	HHD, P&A bn, fld army	12–66G	51	(1)	4	--------	4
118	Pers svc co (type F)	12–67H	147	(4)	18	--------	18
119	Army band	12–107G	43	(1)	4	--------	4
120	APU (AB, FC, HC)	12–550G	38	(4)	18	--------	18
121	Repl reg det (AB, 2CA, 4FA, GB)	12–560G	44	(1)	4	--------	4
122	Admin svc det (type A)	12–570G	43	(1)	4	--------	4
123	Fin DS co	14–17G	115	(4)	18	--------	18
124	DPU (type B)	29–550T	156	(1)	5	--------	5

Table 4-5. Combat Service Support Units (Field Army Support Command)—Continued

1	1 Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
	Misc units						
	CA:						
125	HHC, CA bde	41-201G	239	--------	1	--------	1
126	HHD, CA bn (AD, HB, IC, JC, MB, PB, SB, TB, UB VB, WB, ZC; CA, CB, CC from TOE 29-500G).	41-500G	120	(1)	4	--------	4
127	HHD, CA co (AC, 4AB, IA, 4JA, 4MA, 4SA, 4TA, 4ZA; CA, CB, CC from TOE 29-500G).	41-500G	138	(4)	16	--------	16
	Judge advocate general (JAG):						
128	JAG det (3AA, AB, 6FA, FB, 3GA, GB, 4HA, 2HB, 6IA, IB).	27-500G	138	--------	1	--------	1
	Hist:						
129	Mil hist det	20-17G	2	5	1	1	17
	Pub info:						
130	Pub info tm (AE)	45-500G	17	----------		1	1
131	Pub info tm (FA)	45-500G	13	(1)	4	--------	4

Note. Numbers in parentheses indicate areas where any or all units are employed. They are part of the totals in the other columns.

4-3. Troop Requirements—Theater Army Support Command

a. Mission. The theater army support command (TASCOM) provides combat service support to Army forces in a theater of operations and to other forces as designated. Services include—

(1) General support to the field army.

(2) Direct and general support in the communications zone (COMMZ).

(3) Rear area protection in the COMMZ.

b. Functions. Combat service support functions performed by the TASCOM include administration, civil affairs (CA), construction, maintenance, medical, military police (MP), movements, personnel, legal, field services, comptroller and finance, supply, and transportation.

c. Organization. The TASCOM can support the following forces:

(1) U.S. Army elements of joint, unified, or combined headquarters and units as directed.

(2) Headquarters, theater army.

(3) Headquarters, army group (when used).

(4) One or more field armies consisting of eight to 12 divisions each.

(5) Air defense Artillery Brigade.

(6) Civil affairs brigade.

(7) Military intelligence (MI) group Theater Army.

(8) Theater army reserve units.

(9) U.S. Army Strategic Communications Command (theater).

(10) TASCOM units.

(11) U.S. Army Security Agency (USASA) units.

(12) Other U.S. Army units located in or passing through the COMMZ.

(13) Special Forces Group.

(14) Psychological operations (PSYOP) group.

(15) Special Ammunition Support Command.

(16) Other U.S. Military Services, U.S. Government agencies, allied military forces, and civilian populations as the theater army commander may designate.

d. Subordinate Commands. The TASCOM normally has the following major subordinate commands:

(1) Area support command.

(2) Engineer command.

(3) Medical command.

(4) Personnel command.

(5) Supply and maintenance command.

(6) Transportation command.

4–4. Troop Requirements—Airborne Operation

a. General.

(1) The mission, characteristics of the objective area, enemy dispositions and capabilities, and probable length of time that the air lines of communications will support the airborne force are among the pertinent factors that determine the troop requirements for an airborne force. The complete dependence of an airborne force on a single communications system—air line of communications—until establishment of linkup requires that the planner carefully determine troop requirements for each airborne operation.

(2) Normally, troop list for the Army component of an airborne force includes those units that will directly participate in the operation in a combat or a supporting role. It does not include units required to support the marshalling of the Army forces or the combat service support that may be furnished by the TASCOM agency designated to mount and support the airborne operation.

(3) The number of airborne divisions and corps allocated to theaters of operations will vary. The Department of the Army, based on Joint Chiefs of Staff directives, furnishes such units.

(4) The Army component of an airborne force is usually responsible for its own combat service support in the airborne objective area, regardless of the size or composition of the Army forces. Therefore, the troop list for the Army component of an airborne force will contain sufficient service troops to provide combat service support in the airborne objective area. In all airborne operations the planner carefully considers the combat service support that units in the departure area will provide Army forces in the objective area. He will use this information to the maximum permitted by the characteristics of the operation he is planning. Usually, the nature of the service that the units concerned provide will determine their assignment to the Army component of the airborne force or to the TASCOM supporting the operation. Normally, the number of Army combat service support troops required in an airborne objective area will be considerably less than the number that a ground force containing the same number of divisions employs.

b. Employment of TOE Units. The same types of nondivisional combat service support troops shown for the typical field army in paragraph 4–2 will support airborne divisions, infantry divisions, corps, and field armies used in airborne operations. The number of supporting units will be the minimum to provide only the requirements of the specific force being organized. Frequently, there is a reduction in the strength and organic equipment of a supporting unit to improve its air transportability. Lighter equipment may be substituted for heavy equipment. Because of the inherent differences between ground and airborne operations, many of the units shown in paragraph 4–2 may be omitted from the airborne troop list, while others may be assigned to the TASCOM troops supporting the airborne operation. Of those units assigned to the Army component of the airborne force, a portion may operate in the objective area, while others will support the operation from the departure area.

c. Employment of Special Units. Special units or TOE units with special training and equipment are required for certain airborne operations, particularly those of the independent type.

(1) Specifically structured, trained, and equipped engineer units organized primarily around the engineer light equipment company and the engineer combat battalion (army) are required to rehabilitate airfields or to construct air-landing facilities.

(2) Specially organized, trained, and equipped units provide air terminal facilities in the objective area when aircraft will deliver large tonnages of supplies and equipment for a prolonged period. Normally, Air Force units will provide this support.

(3) The planner determines separately the numbers and types of the special units required for each airborne operation, based on such factors as the airfield repair and construction requirements in the objective area, the tonnage of supplies and equipment to be received in the objective area by air transportation, and the method of supply distribution that will be used in the objective area.

4–5. Troop Requirements—Amphibious Operations

a. Table 4–6 is designed for use in determining typical shore party troop units in addition to those units normally attached to an independent corps of

two assault divisions landing abreast (colm 5), an independent division landing force of two assault brigades landing abreast with one brigade following (colm 4), and a brigade landing team (BDELT) (colm 3) to provide balanced shore parties for amphibious operations. The factors used as a basis for determining the troop requirements can provide only an estimate. The planner must modify requirements to meet the peculiarities of a particular situation.

b. FM 5–144 contains details on shore party organization and planning.

Table 4–6. A Typical Shore Party Troop List

1	1 Unit	2 TOE	3 Per BDELT	4 Per div	5 Per corps
	Engr amph units				
2	HHC, engr amph bde	5–401G			1
3	HHC, engr amph gp	5–402G		1	2
4	Engr amph bn	5–405G	1	2	4
	Cbt spt units				
5	HHC, engr cbt bde, corps	5–101G			1
6	HHC, engr cbt gp	5–52G		1	2
7	Engr cbt bn	5–35G	1	2	4
8	Engr pipeline const spt co	5–177G		1	2
9	Engr pipeline const spt co plat	5–177G	1		
10	HHD, sig gp	11–122F			1
11	Corps sig bn	11–15D			1
12	CO co	11–17G			2
13	CO co plat	11–17G	1		
14	Fld op co	11–18D		1	
15	Fld op co plat	11–18D	1		
16	HHD, cml gp	3–32G			1
17	HHD, cml smoke genr bn	3–266G		1	2
18	Cml smoke genr co	3–267G	1	4	8
	Cbt svc spt units (COSCOM)				
19	HHC, spt bde, corps	54–22G		1	1
20	HHC, spt gp	29–102G	1(–)	1	2
21	Stk con co, spt bde	29–404T		1(–)	1
22	Avn mdm hel co	1–258G		1	2
23	Avn mdm hel co plat	1–258G	1		
24	HHD, TMT gp	55–12G			1
25	HHD, TMT bn	55–16G		1	2
26	Trans lt-mdm trk co	55–67G	1	1	3
27	Trans car co	55–19E			1
28	Trans car co plat	55–19E		1	
29	Trans hv trk co	55–28G			1
30	Trans hv trk co plat	55–28G	1	1	
31	Trans lt trk co	55–17G			1
32	Trans lt trk co plat	55–17G		1	
33	Trans tml trf co	55–118G			1
34	Trans tml trf co plat	55–118G		1	
35	HHD, trans tml bn	55–116E		1	2
36	Trans lt amph co	55–138E		1	2
37	Trans lt amph co plat	55–138E	1		
38	Trans hv amph co	55–140E		1	2
39	Trans hv amph co plat	55–140E	2		
40	Trans TS co	55–117G		1	4
41	Trans acft DS co	55–457G		1	2
42	HHD, med gp	8–122G		1	1
43	HHD, med bn	8–126G	1		2

Table 4–6. A Typical Shore Party Troop List—Continued

1	Unit	2 TOE	3 Per BDELT	4 Per div	5 Per corps
	Cbt svc spt units (COSCOM)—Continued				
44	MASH	8–571E	----	1	2
45	Evac hosp	8–581E	----	1	4
46	Med coll co	8–129G	2(—)	1	1
47	Med clr co	8–128G	----	1	2
48	Med clr co plat	8–128G	1	----	----
49	Med amb co	8–127G	----	1	2
50	Med sup det (FB)	8–500G	----	1	----
51	Med sup det (FC)	8–500G	----	----	1
52	Med det, hel amb (RA)	8–500G	----	1	2
53	Prof svc tms	8–500G	----	As rqr	As rqr
54	HHC, ord ammo DS/GS gp	9–22H	----	----	1
55	HHC, ammo DS/GS bn	9–36G	----	1	2
56	Ammo co, convl	9–38G	----	1	3
57	Ord spec ammo DS co	9–47G	1	1(—)	2
58	Ord GM GS co (HAWK)	9–227E	----	----	1
59	Ord GM GS co plat (HAWK)	9–227E	----	1	----
60	EOD det	9–520G	1	1	3
61	HHD, MP gp	19–272G	----	----	1
62	HHD, MP bn	19–76G	----	1	1
63	MP co	19–77G	1(—)	2	4
64	MP phys scty co	19–97G	----	----	1
65	MP ESCRG co	19–47G	----	1	1
66	MP det, crim inves	19–500E	----	----	1
67	HHD, CA gp, with func tms	41–500G	----	----	1
68	HHD, CA co, with func tms	41–500G	----	1	----
69	Sig small HQ op co	11–147G	----	1	----
70	Pers svc co (type F)	12–67H	----	2	4
71	Pers svc co (type D)	12–67H	1	----	----
72	APU (AB, FB, 3HB)	12–550G	1	----	----
73	APU (AB, FB, FC, 8HB)	12–550G	----	2	----
74	APU (AB, 4FC, 4HC)	12–550G	----	----	4
75	Fin DS co	14–17G	1	2	4
76	Lt maint DS co	29–207F	1	1	3
77	HHD, DS/GS maint bn	29–136G	1	1	3
78	Hv equip GS maint co	29–137G	1	1	3
79	Coll, clas, and salv co	29–139F	----	----	1
80	LE GS maint co	29–134G	----	----	2
81	HHC, S&S GS bn, fwd	29–116G	1	1	2
82	S&S DS co	29–147G	1	1	3
83	Gen sup GS co, fwd	29–118H	----	1	3
84	Gen sup GS co plat, fwd	29–118H	1	----	----
85	Rep parts GS co, fwd	29–119H	----	1	2
86	Rep parts GS co plat, fwd	29–119H	1	----	----
87	Fld svc co, GS	29–114G	----	1	2
88	Petrl sup co	10–227G	----	1	----
89	HHC, petrl op bn	10–206E	----	----	1
90	Petrl op co	10–207G	----	----	1

4-6. Troop Planning Slices

a. Purpose. In administrative planning a preliminary estimate of the total size of a force is required to determine the final composition and the ultimate size of the force. The required number of combat service support units, such as hospitals, depot units, etc, bears a direct relationship to the size of the total force. Two factors are used in such planning—the division slice and the air wing slice. To determine the preliminary total of the force, the planner multiplies the division slice by the number of divisions in the force and adds the product to that of the air wing slice multiplied by the number of air wings in the force; to this sum he adds the various miscellaneous forces not included in either slice.

b. Definitions.

(1) *Division slice*—The strength of an average combat division plus proportionate shares of the total corps, field army, COMMZ, and continental United States (CONUS) (for worldwide slice only) units operating to the rear of the division (and of Navy units directly supporting the Marines in case of Marine divisions). The division slice for any given force is equal to the total strength of the force divided by the number of combat divisions in the force.

(2) *Air wing slice*—The strength of an average air wing plus a proportionate share of the Air Force and Army units engaged in developing or operating the airbases (and of Navy units that directly support the Marine or Navy air units).

c. Relationship Between Division Slice and Air Wing Slice. The 7,000-man air wing slice (fig. 4–2) includes about 1,000 Army COMMZ men not counted in a division slice. These 1,000 Army men are required for COMMZ support of Air Force units and installations present in the theater of operations. From the information in *a* and *b* above and figures 4–1 and 4–2 below, the planner makes this same assumption—the air wing slice, not the division slice, contains the COMMZ support for the Air Force. This allows troop planners to use the data in the figures below with varying ratios of air wings to Army divisions in any specific force.

d. Basic Slice Factors. Paragraphs 5–23 and 9–2 show the location of slice components as contrasted with the assignment of slice components shown here. Figure 4–1 shows the division slice and figure 4–2 shows the air wing slice.

4-7. Division and Air Wing Slices

a. Division Slice. Table 4–7 presents the percentages of each arm, service, and other major grouping in each part of a large balanced force. Its basis is the logical breakout of the units that comprise a *typical* 12-division field army. All TOE

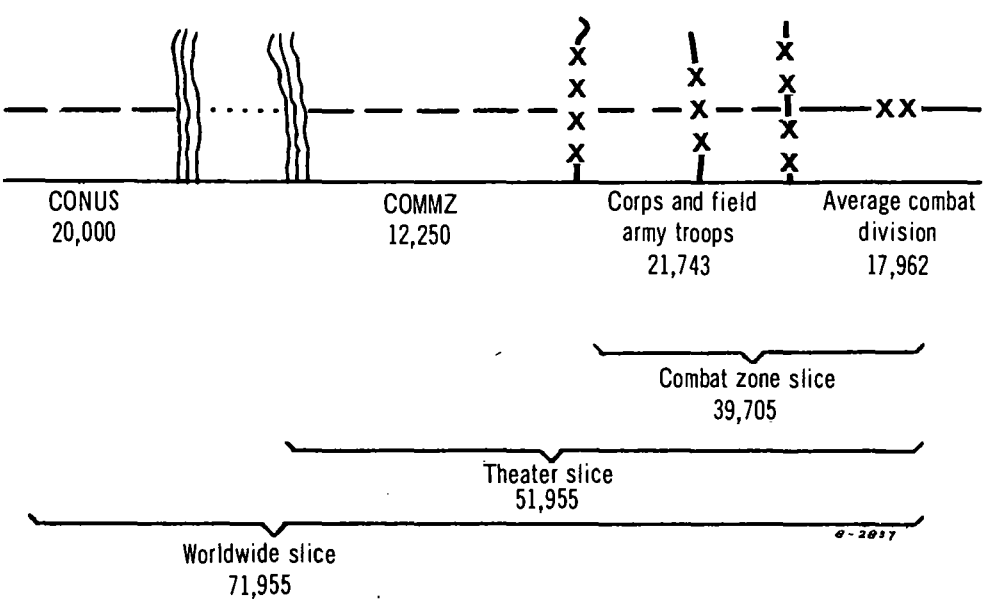


Figure 4–1. Division slice.

strengths, as far as possible, are from published or draft TOE for field army units, as presented in paragraph 4–2 and in other chapters of this manual. The COMMZ percentages (colm 5) do not include those Army COMMZ troops that must be present to support the Air Force (para 4–6*b* and *c*). Percentages in the CONUS portion of the worldwide slice (colm 3) are those from previous editions of this manual.

b. Air Wing Slice. Table 4–8 presents the percentages of components, branches, and other major groupings present in the theater of operations. Its basis is a typical U.S. Air Force troop list and a typical Army force.

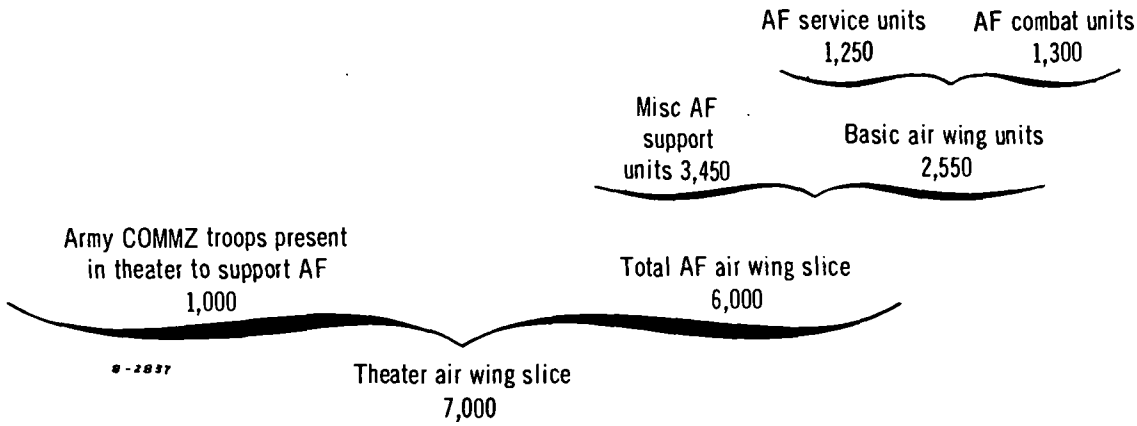


Figure 4–2. Air wing slice.

Table 4–7. Division Slice

1	2	3	4	5	6	7	8
	Worldwide slice (percentage)		Theater slice (Army) (percentage)		Combat zone slice (Army) (percentage)		
Branch or other major groupings	Total (71,955 men)	CONUS portion (20,000 men)	Total (51,955 men)	COMMZ portion (12,250 men)	Total (39,705 men)	Corps fld army and rear portion (21,743 men)	Average cbt div. only (17,962 men)
Cbt div	25.0	0.0	34.6	0.0	45.2	0.0	100.0
HQ, thtr, fld army, corps, TASCOM, FASCOM, spt bde, spt gp.	3.8	9.5	1.7	4.5	0.8	1.4	0.0
Sep bde	0.7	--------	1.0	--------	1.3	2.4	0.0
Inf	0.8	0.4	1.0	--------	1.2	2.3	0.0
Armor	2.1	0.3	2.8	--------	3.7	6.7	0.0
Arty	7.1	1.6	9.2	--------	12.1	22.1	0.0
Avn (cbt spt)	0.5	--------	0.7	--------	0.8	1.5	0.0
Cml	0.4	0.2	0.5	0.3	0.6	1.0	0.0
Engr	8.5	4.0	10.2	14.3	8.9	16.2	0.0
Other cbt spt (intel, sig, USASA)	2.9	1.7	3.3	0.9	4.0	7.4	0.0
Ammo	1.5	0.4	1.9	3.5	1.4	2.6	0.0
Maint	5.1	1.4	6.5	7.9	6.0	10.9	0.0
Med	6.2	4.9	6.8	17.6	3.4	6.2	0.0
MP	2.5	0.9	3.2	9.8	1.0	1.8	0.0
S&S	5.7	2.6	6.8	14.8	4.3	8.0	0.0
Trans	6.2	5.0	6.7	16.3	3.7	6.7	0.0
Pers svc	1.2	--------	1.5	3.6	0.9	1.6	0.0
Other cbt svc spt	1.1	--------	1.6	6.5	0.7	1.2	0.0
Repl (CONUS)	6.4	23.0	0.0	0.0	0.0	0.0	0.0
Other CONUS	12.3	44.1	0.0	0.0	0.0	0.0	0.0
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of worldwide slice	100.0	27.8	72.2	17.0	55.2	30.2	25.0
Percentage of thtr slice			100.0	23.6	76.4	41.8	34.6
Percentage of CZ slice					100.0	54.8	45.2

Table 4-8. Air Wing Slice

	1	2	3	4
1	Component, branch, or other major grouping	Theater total—7,000 men (percentage)	Air Force total—6,000 men (percentage)	Basic air wing 2,550 men—(1,300 cbt) (1,250 svc)[1] (percentage)
	Air Force:			
2	HQ and overhead [2]	(3. 0)	(3. 3)	
3	Cbt	18. 6	21. 7	51. 0
4	Svc	17. 9	20. 8	49. 0
5	Misc spt	49. 2	57. 5	
	Army:			
6	COMMZ spt	14. 3		
7	Total percentage	100. 0	100. 0	100. 0
8	Percentage of air wing slice	100. 0	85. 7	36. 4

[1] Located on the cbt airfield; includes all elements organic to wing.
[2] Includes various Air Force headquarters and misc overhead units. Percentages in parentheses are included in total percentages of misc spt, line 5.

Section II. TACTICAL TROOP MOVEMENTS

4-8. General

a. Introduction. The examples of forms for movement tables and graphs are guides for preparing similar tables for units in the field. Tables for field use must conform to the variations in strengths of units and the amount of transportation and equipment available. Brigades, separate battalions, and similar units should maintain tables showing length-of-column (LGTHCOLM) requirements of their units, based on actual strength and materiel on hand. Reports of subordinate units form the bases for tables of larger units. Brigade headquarters maintains tables of normally attached units. However, a table based on actual strength of men and materiel may be worthless without proper evaluation of the weather, road aspects, nuclear aspects, hostile air and mechanized threats, or other factors affecting the troop movement. These basic figures are capable of being increased or decreased under extremes of the variable factors. In considering movement data under nuclear conditions, the planner should evaluate the relatively unprofitable target presented by a narrow, long column and the possibly high vulnerability of several columns along parallel routes at the same time. Troop movement data in the examples of tables of basic LGTHCOLM's and tables of rates and lengths of marches are average from field experience.

b. Basic LGTHCOLM's. The following values apply in computing LGTHCOLM's except when greater dispersion is desired to reduce the effect of unfavorable factors, such as those mentioned in *a* above.

(1) Foot troops (at halt or marching):

	2 meters per man	*5 meters per man*
Single file, per man	2. 4	5. 4
Column of twos, per man	1. 2	2. 7

(2) Motor elements (at halt):

	Length of vehicle (meters)
Car, passenger	7
Armored personnel carrier	6
Tank	10
Tank, with cargo carrier or weapon in tow	13
Tractor	7
Tractor, with cargo trailer or weapon in tow	14
Tractor, 5-ton, with semitrailer, 15-ton, low-bed	28
Tractor, 10-ton, with semitrailer, tank transporter 50-ton	28
Trucks:	
¼-ton	4
¼-ton, with cargo trailer or weapon in tow	8
½- or ¾-ton	6
½- or ¾-ton, with cargo trailer or weapon	9
2½-ton	8
2½-ton, with cargo trailer or weapon in tow	15
More than 2½-ton	9
More than 2½-ton, with cargo trailer in tow	15
6-ton, cargo (treadway)	13
10-ton, with 8-in. howitzer	21
5-ton, with 155-mm howitzer	15
Pershing, XM474, self-propelled	5
5-ton tractor, with Sergeant, XM504	17
Average per vehicle for a mixed column of various types	10

(3) Use of values.

(*a*) A dismounted battalion of 800 men organized as four companies, totaling 19 platoons; company—100 meters; platoon distances—50 meters; formation—column of twos, 5 meters between men: LGTHCOLM $=800\times2.7+3\times100+15\times50=3{,}210$ meters.

(*b*) A mixed motor column consisting of—

	Meters
20 trucks, ¼-ton, with weapons in tow at 8 meters each	160
25 trucks, ¾-ton, with trailer in tow at 9 meters each	225
40 trucks, 2½-ton, with trailers in tow at 15 meters each	600
40 tanks at 10 meters each	400
125 total	
Total LGTHCOLM at halt	1,385

Alternate solution ((2) above):

125 vehicles (mixed) at 10 meters each 1,250

c. Halts (Motor March).

(1) *Short halts.*

(*a*) The observance of routine short halts is at the discretion of the commander controlling road movement over the route in question.

(*b*) A halt of 15 minutes is normally made at the end of the first hour. Thereafter, a 10-minute halt is normally made after each 110 minutes' running time.

(2) *Long halts.*

(*a*) One-half to one hour is allowed for mess and refueling stops. When other convoys must pass, the planner should schedule a mess and refueling halt to coincide with the passing, thus using the necessary delay to advantage.

(*b*) Long halts must be specifically authorized and plotted on movement graphs.

(*c*) FM 55–35 gives detailed information on operational road movement orders, tables, and graphs.

d. Pass Times. Figure 4–3 shows pass times (PST) of columns on foot, column of twos, 5 meters per man; it does not include column gaps (COLMGP).

e. Rates and Lengths of Road Movements, Foot and Motor Elements.

(1) *General.* The rates and lengths of marches (in table 4–9 are based on modern vehicles, trained personnel, and favorable road and weather conditions). Hence, rates of march for motorized elements in columns 2 and 3 are possible only on improved roads. The rate of march of a column of elements with different rates of march is regulated by that of the slowest element. The rate of march represents the average speed over a period, including short, periodic halts. However, under forced march conditions, troops can cover greater distances than those given in column 6. For movements on foot over mountainous terrain, planners should allow an additional hour for each 300 meters of climb.

(2) *Road movements in snow and extreme cold.*

(*a*) *Foot.* Foot troops marching in snow without snowshoes or skis have decreased mobility. This decrease depends on several factors, among which are depth and nature of the snow. Normally, snow of a depth of 64 centimeters or more will prohibit marching unless troops wear skis or snowshoes. For specially trained troops the following rates of march are practicable:

Snowshoes	2½ to 4 kilometers per hour.
Skis	2½ to 5½ kilometers per hour.

Small bodies of well-trained troops are capable of moving 64 kilometers a day on skis under favorable conditions.

(*b*) *Motor movement (wheeled) in snow.*

Depth of snow (cm)	*Measures required for movement*
7.5	None.
15	Rear chains.
15–45	Chains all around and special traction devices on leading vehicles (to break the trail).
45 and more	Snowplow required.

f. Forced Marches of Foot Elements. For planning purposes a normal foot march covers 32 kilometers per day at a rate of 4 kilometers per hour. A forced march requires the expenditure of more than the normal effort in speed, exertion, hours marched, or a combination of these. Forced marches are normally accomplished by increasing the number of hours marched rather than by increasing the rate of march. Commanders should take full advantage of those periods when the troops are most rested to increase the rate of march.

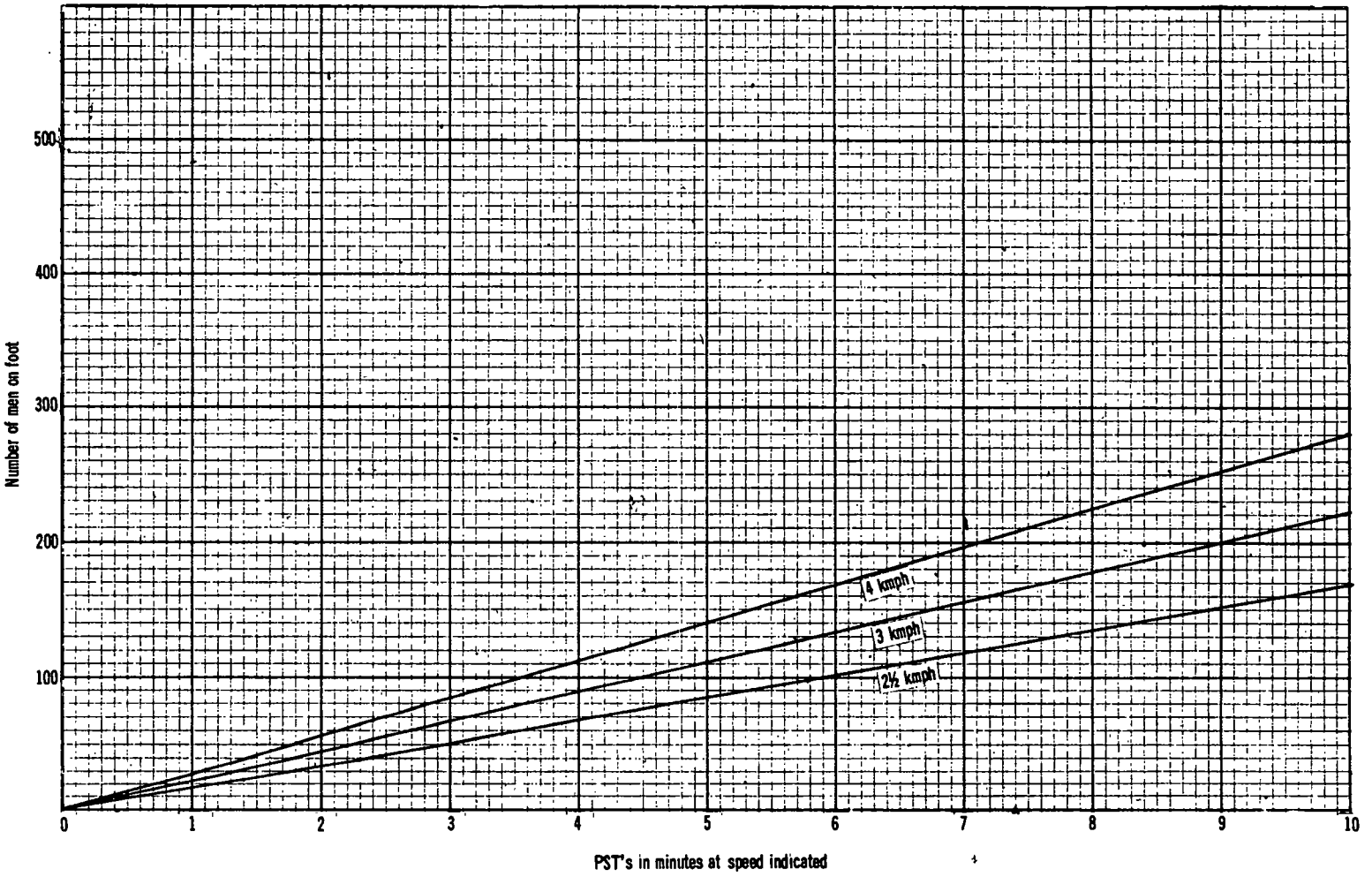


Figure 4-8. PST of columns on foot—column of twos, 5 meters per man (does not include COLMGP's).

Table 4-9. Rates and Lengths of Road Movements, Foot and Motor Elements

1	2	3	4	5	6	7
Unit	Rates of march (kmph)				Lengths of march on roads (km per day (avg))	Remarks
	On roads		Cross country			
	Day	Night	Day	Night		
Inf						
2 Ft trps	4	3	2½	1½	19–24 for a div; 24–32 for smaller units.	Length of march increased with well-seasoned trps marching on good roads in favorable wea when required by the tac sit.
Arty						
3 Trkdr, lt or mdm	40	40 (lights) 16 (no lights).	12	8	320	Avg rate 8 kmph.
4 Trkdr, hv	29	29 (lights) 16 (no lights).	10	6	232	Avg rate 8 kmph.
5 Tracdr, hv	24	24 (lights)	10	6 (lights) 1½ (no lights).	192	Avg rate 8 kmph.
6 ADA, msl	32	32 (lights) 16 (no lights).	8	3	256	Avg rate 8 kmph.
7 ADA, SP	32	32 (lights) 16 (no lights).	19	8	256	Avg rate 8 kmph.
Armor						
8 Tks, lt, and armd carr	32	32 (lights) 16 (no lights).	24	8	256	Armd div moves at rate of march of MBT's. Avg rate 8 kmph.
Armor						
9 Tks, main bat	28	24 (lights)	16	4½	224	Avg rate 8 kmph.
Misc						
10 Inf div, motorized	24	24 (lights) 16 (no lights).			192	Avg rate 8 kmph.
11 Trks and ambs not carrying pnts.	40	40 (lights) 16 (no lights).			320	Single veh or small colms of less than 50 veh. Avg rate 8 kmph.
12 Ambs carrying pnts	24	16 (lights)	8	8	190	Avg rate 8 kmph.
13 Cars, pax	55	55 (lights) 16 (no lights).			440	Avg rate 8 kmph.

They should schedule rest periods to avoid marching at extremely hot times of the day and to insure the arrival of the unit in effective fighting condition.

g. Vehicle Capacities for Personnel. The capacity of motor transport for movement of foot troops depends on the rated capacity of the transportation employed, the type of body on the vehicles, the method of carrying personnel, and the distance personnel are to move. Normal capacities for trucks carrying personnel with hand-carried weapons, packs and extra ammunition, with no additional cargo, and excluding driver, are—

	Men
Armored personnel carrier	11
Truck, ¼-ton	3
Truck, ¾-ton	9
Truck, 2½-ton	20
Semitrailer, 12-ton	50

Note. When 2½-ton engineer dump trucks carry the loads shown above, some personnel will have to stand; 12-ton semitrailers should haul troops only in emergencies.

h. Tabulating Number of Trucks Required for Movement by Motor Transport. The format in table 4–10 will assist in tabulating the approximate number of trucks required to move foot elements with individual equipment.

Table 4–10. Tabulating Truck Requirements

	1	2	3	4	5
1	Unit	Actual strength	Transported in organic motors	Strengths that require transportation	Number of 2½-ton trucks required
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

4–9. Basic Terms and Formulas

a. Traffic Flow of Motor Columns. Traffic flow is tthe total number of vehicles passing a given point in a given time. Traffic flow is expressed in vehicles per hour. The following formula will help determine the traffic flow for any route:

Traffic flow in vehicles per hour = density in vehicles per kilometer × speed in kilometers per hour × F.

F (a variable) depends on the standing operating procedure (SOP) time gaps between march units and serials applicable in the area and on the overall state of proficiency of units operating in the area in motor movement and traffic control. For adaptation to a specific area under field conditions, continuous time and space studies are necessary to arrive at a suitable factor. This study may result in a basic factor to which the planner must add allowance for a time gap between march units and serials or a basic factor including allowance for a time gap between march units and serials.

b. Density of Motor Columns.

(1) Traffic density is the average number of vehicles per kilometer or mile of road expressed in vehicles per kilometer or vehicles per mile. Motor columns may be either close column, open column, or infiltration.

(*a*) *Close column.* In close column, vehicles are closed to safe driving distance behind the preceding vehicle. Usually, a fixed speedometer multiplier (SM) is specified (such as 2, 3, 4, etc.) to accomplish a safe driving intervehicular distance at all speeds.

Note. For logistic purposes SM is any number by which speed in kilometers or miles per hour is multiplied to determine the gap between successive vehicles in meters.

Example: With an SM of 2 the gap between successive vehicles at a speed of 15 kilometers per hour is 2×15=30 meters; at a speed of 40 kilometers per hour, it is 2×40=80 meters.

(*b*) *Open column.* In open column, distances between vehicles are increased to accomplish greater dispersion. Usually, a fixed distance (such as 90 or 180 meters between vehicles) is specified, but open column conditions may be obtained by designating a fixed SM high enough to insure the desired intervehicular gap at the lowest speed expected.

(*c*) *Infiltration.* In infiltration, vehicles are dispatched at irregular intervals with a fixed density (such as 3, 4, 5, or 6 vehicles per kilometer).

(2) To determine the density of a motor column, when the speed and SM are known, the following formula applies:

$$\text{Density}=\frac{1{,}000\text{ (m per km)}}{\text{speed (kmph)}\times\text{SM}+\text{VL}}=\text{when}$$

VL=vehicle length.

Example. With a speed of 15 kilometers, an SM of 2, and a VL of 10, vehicle density equals—

$$\frac{1{,}000}{15\times2+10}=25\text{ vehicles per kilometer}$$

c. LGTHCOLM.

(1) LGTHCOLM is the length, expressed in units, of a column on the road. LGTHCOLM is the sum of the lengths of the vehicles, the distance between vehicles, and the distance between march elements.

(2) The number of motor vehicles in the column (disregarding trailers and towed weapons), the average density (number of vehicles per kilometer), and the total time gaps between subordinate units determine the LGTHCOLM occupied by a motor column.

$$\text{LGTHCOLM} = \frac{\text{number of motor vehicles}}{\text{density (vehicles per km)}} + \frac{\text{time gaps} \times \text{speed (kmph)}}{60}$$

The following can determine an approximation of LGTHCOLM:

LGTHCOLM (km) = number of vehicles ÷ 75 (less than 25 vehicles in close column).
= number of vehicles ÷ 30 (25 or more vehicles in close column).
= number of vehicles ÷ 20 (less than 25 vehicles in open column).
= number of vehicles ÷ 15 (25 or more vehicles in open column).
= number of vehicles ÷ 3 (any number of vehicles marching by infiltration).

In close column a 15-minute time gap occupies 4 kilometers' LGTHCOLM and in open column 6 kilometers' LGTHCOLM.

d. PST. The PST of a column is the time required for the column to pass a given point. The PST may be determined by the following formula:

$$\text{PST (min)} = \frac{\text{LGTHCOLM (km)} \times 60}{\text{speed (kmph)}}$$

The following can determine an approximation of PST:

PST (min) = number of vehicles × 0.08 (less than 25 vehicles in close column).
= number of vehicles × 0.18 (25 or more vehicles in close column).
= number of vehicles × 0.20 (less than 25 vehicles in open column).
= number of vehicles × 0.30 (25 or more vehicles in open column).
= number of vehicles × 1.33 (any number of vehicles marching by infiltration).

Add 1 minute per 25 vehicles to the PST of each serial.

e. Time Distance. Time distance (TDIS) is the time required for any one individual or vehicle to travel between two given points. The following formula can determine TDIS:

$$\text{TDIS} = \frac{\text{distance}}{\text{rate of march}}$$

f. Road and Time Gap.

(1) Road gap is the distance between march elements. The road gap between march elements is more significant when the column is moving than when the column is halted; therefore, it is generally a factor of time rather than distance ((2) below). The following formula can determine the road gap:

$$\text{Road gap} = \frac{\text{time gap (min) x rate (kmph)}}{60}$$

(2) Time gap may be the conversion of road gap to time. There are no prescribed standard gaps. These depend on the size of serials and march units, the time available for the movement, as well as the tactics required for protection against air and nuclear attack. All divisions (typical), when moving by motor in a tactical march, may move in up to six march columns—one serial per brigade, one serial for division artillery, one serial for division troops, and one serial for the division support command (DISCOM). These march columns subdivide into battalion serials and march units of company, troop, or battery size. Examples of time gaps between these march elements are as follows:

Between march columns (brigades, division artillery, division troops, and DISCOM)—15 minutes.

Between serials (battalion)—5 minutes.
Between march units—2 minutes. (See FM 61-100.)

4-10. Aids to Planning

a. General. The detailed work of planning troop movements can be simplified by preparing in advance tables, graphs, and other aids based on statistical data and experience factors of the unit. The most important of these aids are—

(1) Tables of simplified formulas for LGTH COLM's and PST's.
(2) Tables of precalculated LGTHCOLM's and PST's.
(3) LGTHCOLM and PST nomographs.
(4) Unit table of LGTHCOLM's and PST's.
(5) Tables of TDIS's.
(6) Tables of average time factors.
(7) Road movement graphs.
(8) Road movement tables.
(9) Strip map.
(10) Vehicle availability tables.
(11) Vehicle assignment tables.
(12) March calculators.

b. Table of Simplified Formulas for LGTHCOLM's and PST's. Table 4-11 provides an example of tables of simplified formulas for LGTHCOLM's and PST's. The table allows a time gap of 2 minutes between company march units (2 minutes per 25 vehicles) and builds them into the formulas. It does not include time gaps between serials. A planner can easily construct similar tables for other units; he must keep in mind the number of time gaps to be built into the formula.

DERIVATION OF SIMPLIFIED FORMULAS

1. Forty-eight vehicles per kilometer is the density employed when marching in *close column* formation; therefore, each vehicle in a continuous march element occupies a LGTHCOLM of 0.0208 kilometer. The company-size march unit (averaging 25 vehicles or less) is assumed to be the continuous march element. This vehicular LGTHCOLM, when multiplied by the total number of vehicles (25 or less) in the column, gives the value for the LGTHCOLM:

$$\text{LGTHCOLM for one vehicle} = 0.0208 \text{ or } \frac{V}{48} \text{ km.}$$

The LGTHCOLM for one vehicle can be converted to PST, using the equation

$$\text{PST} = \frac{\text{LGTHCOLM}}{\text{rate of march}}$$

as follows:

$$\text{PST} = \frac{0.0208}{16} \times 60 \text{ (to convert to min)} = 0.0788 = 0.08 \text{ minute.}$$

The constant 0.08, when multiplied by the total number of vehicles (25 or less) in the column, computes the PST of the column (PST = 0.08V min).

2. If a *close column* serial consists of more than 25 vehicles, the time gaps between subordinate march units must be considered in the calculations. This is done by converting this time gap, 2 minutes per 25 vehicles, to 0.10 minute per vehicle and adding this value to the constant 0.08 (PST = 0.18V min). This value of PST can be converted to LGTHCOLM as follows:

$$\text{PST} = \frac{\text{LGTHCOLM}}{\text{rate of march}}$$

$$\text{LGTHCOLM} = \text{PST} \times \text{rate of march}$$

$$\text{LGTHCOLM} = 0.18V \times \frac{16}{60} = 0.048V.$$

3. Twelve vehicles per kilometer is the density employed when marching in *open column* formation; therefore, each vehicle occupies a space of 0.08 kilometer. For a continuous element, then—

$$\text{LGTHCOLM for one vehicle} = 0.08 \text{ or } \frac{V}{12} \text{ km.}$$

The LGTHCOLM for one vehicle can be converted to PST as follows:

$$\text{PST} = \frac{0.08}{24} \times 60 \text{ (to convert to min)} = 0.2 \text{ minute.}$$

The constant 0.2, when multiplied by the total number of vehicles (25 or less), computes the PST of the column (PST = 0.2V min).

4. If an *open column* serial consists of more than 25 vehicles, the time gap between subordinate march units, 0.10 minute per vehicle, must again be considered. Thus—

PST = 0.3V minute.

This value of PST can be converted as in 2 above.

5. Whenever a column (*open* or *close*) consists of two or more march serials of brigade size, the 15-minute time gap between these serials must be considered in calculations.

Example:
PST = 0.18V min
Rate of march (R) = 16 kmph
Time (T) = 60 min
Time gap (TG) = 15 min
Close column

$$\text{LGTHCOLM} = \text{PST} \times \frac{R}{T} + \frac{TG \times R}{T} = 0.18V \times \frac{16}{60} + \frac{15 \times 16}{60} = (0.48V + 4.0) \text{ km.}$$

6. Two vehicles per kilometer is the density employed when marching by *infiltration;* therefore, each vehicle occupies a LGTHCOLM of 0.50 kilometer. This LGTHCOLM, when multiplied by the total number of vehicles, gives the LGTHCOLM:

$$\text{LGTHCOLM} = 0.5V \text{ or } \frac{V}{2} \text{ km.}$$

Table 4–11. Example of Tables of Simplified Formulas for LGTHCOLM's and PST's

1	Column formation	2 Rate (kmph)	3 Density (veh per km)	4 Number of serials	5 Number of vehicles in serial	6 LGTHCOLM (km)	7 PST (min)
2	Close column	16	48	One	25 or less	0.0208V	0.08V
					More than 25	0.048V	0.18V
				Two or more	25 or less	0.0208V +4.0	0.08V/15TG
					More than 25	0.048V +4.0	0.18V/15TG
3	Open column	24	12	One	25 or less	0.08V	0.2V
					More than 25	0.12V	0.3V
				Two or more	25 or less	0.08V +6.0	0.2V/15TG
					More than 25	0.12V +6.0	0.3V/15TG
4	Infiltration	24	2	NA	Any number	0.5V	1.25V

Note. V is number of vehicles; TG is number of intervals between serials of brigade size.

The LGTHCOLM can be converted to PST as follows:

$$PST=\frac{0.5}{24}\times 60=1.25 \text{ minutes.}$$

c. Table of Precalculated LGTHCOLM's and PST's. Table 4–12 provides an example of a table of precalculated LGTHCOLM's and PST's, based on simplified formulas (*b* above).

Table 4–12. Example of a Table of Precalculated LGTHCOLM's and PST's

a. Movement of Less Than 25 Vehicles

1	1 Number of vehicles in column	2 LGTHCOLM (km) Close column 48 veh per km 16 kmph	3 LGTHCOLM (km) Open column 12 veh per km 24 kmph	4 PST (min) Close column 48 veh per km 16 kmph	5 PST (min) Open column 12 veh per km 24 kmph
2	1	0.0208	0.08	0.08	0.2
3	2	0.0416	0.16	0.16	0.4
4	3	0.0624	0.24	0.24	0.6
5	4	0.0832	0.32	0.32	0.8
6	5	0.1040	0.40	0.40	1.0
7	6	0.1248	0.48	0.48	1.2
8	7	0.1456	0.56	0.56	1.4
9	8	0.1604	0.64	0.64	1.6
10	9	0.1872	0.72	0.72	1.8
11	10	0.2080	0.80	0.80	2.0
12	20	0.4160	1.60	1.60	4.0

b. Movement of 25 or More Vehicles

1	1 Number of vehicles in column	2 LGTHCOLM (km) Close column 48 veh per km 16 kmph	3 LGTHCOLM (km) Open column 12 veh per km 24 kmph	4 PST (min) Close column 48 veh per km 16 kmph	5 PST (min) Open column 12 veh per km 24 kmph
2	1	0.048	0.12	0.18	0.3
3	2	0.086	0.24	0.36	0.6
4	3	0.144	0.36	0.54	0.9
5	4	0.192	0.48	0.72	1.2
6	5	0.240	0.60	0.90	1.5
7	6	0.288	0.12	1.08	1.8
8	7	0.336	0.84	1.26	2.1
9	8	0.384	0.96	1.44	2.4
10	9	0.432	1.08	1.62	2.7
11	10	0.480	1.20	1.80	3.0
12	20	0.960	2.40	3.60	3.3
13	30	1.440	3.60	5.40	9.0
14	40	1.920	4.80	7.20	12.0
15	50	2.400	6.00	9.00	15.0
16	60	2.880	7.20	10.80	18.0
17	70	3.360	8.40	12.60	21.0
18	80	3.840	9.60	14.40	24.0
19	90	4.320	10.80	16.20	27.0
20	100	4.800	12.00	18.00	30.0
21	200	9.600	24.00	36.00	60.0
22	300	14.400	36.00	54.00	90.0
23	400	19.200	48.00	72.00	120.0
24	500	24.000	60.00	90.00	150.0

Illustration of Use.

PROBLEM. Determine the PST of two infantry brigades, one with four battalions consisting of 500 vehicles and the other with three battalions of 350 vehicles, moving as one march column in close column formation.

SOLUTION. Add the following from b in table above:

PST for 800 vehicles=144.00 minutes.

PST for 50 vehicles=9.00 minutes.

Time gap=40 minutes (15.00 minutes between brigades and 5 minutes between battalion-size serials).

PST=193.00 minutes for 850 vehicles.

Note. Time gaps of 2 minutes between company-size march units have been allotted for and built into the values in the table.

d. LGTHCOLM and PST Nomograph.

(1) The nomograph in figure 4–4 shows average LGTHCOLM's and PST's under ideal conditions and does *not* include allowance for time gaps between march units. Actual LGTHCOLM's and PST's may vary somewhat, depending on conditions.

(2) To determine LGTHCOLM's—

(*a*) Determine the number of motor vehicles in column, disregarding trailers or towed weapons.

(*b*) Locate the figure on vertical scale at left of chart, marked "Number of vehicles."

(*c*) Locate the figure showing average density under which the movement will be made on the vertical scale marked "Density (veh per km)."

(*d*) Connect these two points with a straightedge. Read the figure at the point of intersection of the straightedge with the vertical scale marked "LGTHCOLM (km)."

(*e*) This will be the LGTHCOLM, in kilometers, occupied by the column under the given conditions.

(3) To determine PST's—

(*a*) Obtain LGTHCOLM as directed in (2) above.

(*b*) Locate the figure representing the speed in kilometers per hour on the vertical scale marked "Speed (kmph)."

(*c*) Connect these two points with a straightedge.

(*d*) Read the figure at the intersection of the straightedge with the vertical scale marked "PST (min) (hr)."

(*e*) This figure is the PST of the column under the conditions given.

e. Unit Table of LGTHCOLM's and PST's. This format, provided in table 4–13 is for the infantry division. By use of appropriate TOE's and the basic formulas contained in *b* above, complete tables can be prepared for any unit.

f. Table of TDIS's. Precomputed tables of TDIS's for routine rates of march will simplify calculations. Table 4–14 is an example of such a table, based on 16 kilometers per hour.

g. Average Time Factors—Infantry Division.

(1) These data pertain to G3 time factors considered after an infantry division receives a movement order. They give the times required by the command for—

(*a*) Making preparation before the leading vehicle can arrive at the start point (SP).

(*b*) Completing the motor march and making preparations to launch a coordinated attack.

(2) The preparations before the leading vehicle can arrive at the SP include transmission of orders by division; assembling trucks; spotting trucks; map reconnaissance of routes, detrucking areas, and assembly areas; issue of extra ammunition; briefing of troops; and other normal preparations for an anticipated movement. This preparation pertains to the *first* trip, whether the division is completely motorized by the attached transportation and moves in one trip or whether the division moves by organic transportation in two or more trips (echelon). The earliest time in which the leading vehicle can pass the SP after receipt of the order by the division commander is as follows:

(*a*) If the order is received in daylight for a daylight march (e.g., received at 1000), leading vehicle can cross the SP at 1130—1½ hours.

(*b*) If the order is received at night for a night march (e.g., received at 2200), leading vehicle can cross the SP at 2400—2 hours.

(*c*) If the order is received in daylight for a night march (e.g., received at 1100), leading vehicle can cross the SP 1 hour after evening nautical twilight. (For evening nautical twilight, see para 3–16*c*.)

(*d*) If the order is received at night for a daylight march, and more than 2 hours before morning nautical twilight (e.g., received at 0200), leading vehicle can cross the SP at morning nautical twilight. (If the order is received less than 2 hours before morning nautical twilight, the time is the time the order was received plus 2 hours.)

Note. To determine corresponding time factors for a foot march rather than a motor march, use ½ hour less in (*a*), (*b*), and (*c*) above.

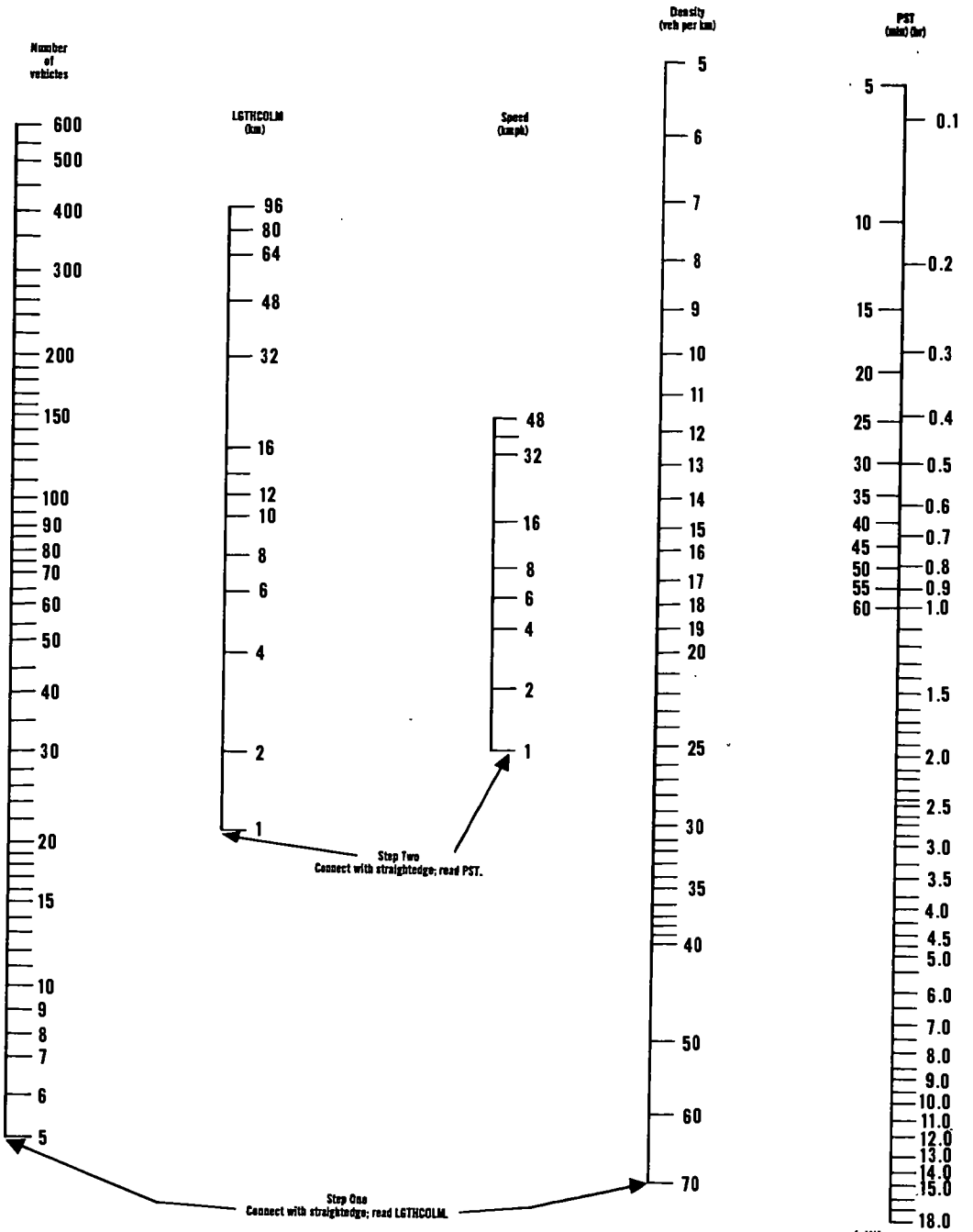


Figure 4–4. LGTHCOLM and PST nomograph.

Table 4–13. Example of Format for a Unit Table of LGTHCOLM's and PST's [1]

1	1	13	14	15	16	17	18	19	20	21	22	23
		PST (min)							LGTHCOLM (km)		PST (min)	
1	Unit	Men on foot colm of twos			Veh in march colm (colm 8)		Additional veh to carry foot trps (colm 9) (2½-ton trk)[2]	Total veh in march colm when unit moves by trk (colm 8 + colm 18)	Veh of units motorized (colm 19)		Veh of units motorized (colm 19)	
		2.5 kmph	3 kmph	4 kmph	Close colm 48 veh per km 16 kmph	Open colm 12 veh per km 24 kmph			Close colm 48 veh per km 16 kmph	Open colm 12 veh per km 24 kmph	Close colm 48 veh per km 16 kmph	Open colm 12 veh per km 24 kmph
2	Inf div (1)											
3	HHC											
4	Inf bde (each) (3)											
5	HHC											
6	Inf bn (each) (8)											
	*	*		*			*	*		*		*
9	Tk bn (each) (2)											
	*	*		*			*	*		*		*
12	Armd cav sqdn											
	*	*		*			*	*		*		*
16	Div arty											
	*	*		*			*	*		*		*
28	Avn bn											
	*	*		*			*	*		*		*
32	Engr bn											
	*	*		*			*	*		*		*
36	Sig bn											
	*	*		*			*	*		*		*
41	MP co											
42	Inf DISCOM											
	*	*		*			*	*		*		*

[1] Based on TOE _____, dated _____.
[2] Based on 20 men per 2½-ton trk with tlr.

Note 1. Use data in *d* above as guide in completing form.
2. Colm 2, 3, and 9—based on periodic reports of subordinate units.
3. Colm 6—group that normally precedes main body to a new area for reception of trps.
4. Colm 7—veh not required for immediate spt, e.g., kitchen, baggage, mtr maint, are designated fld trns.
5. Colm 10—number of men on foot (colm 9) × 1.2 or 2.7 (para 4-8*b*(1)) + COLMGP's=meters.
6. Colm 11, 12; 20, 21—number of veh × factor (para 4-9*c*) + time gaps in km=km.
7. Colm 13–15—$\frac{\text{LGTHCOLM (colm 10)} \times 60}{\text{speed (kmph)}}$=PST (min).
8. Colm 16, 17; 22, 23—number of veh × factor (para 4-9*d*) + time gaps = PST (min).
9. Colm 18—number of men on foot (colm 9) ÷ 20 except to insure tactical integrity.

Table 4–14. Example of a Table of TDIS's

Distance traveled km → / km ↓	0	1	2	3	4	5	6	*7	8	9
0	0	4	8	11	15	19	23	26	30	34
10	38	41	45	49	53	56	60	64	68	71
20	75	79	83	86	90	94	98	101	105	109
30	113	116	120	124	128	131	135	139	143	146
40	150	154	158	161	165	169	173	176	180	184
50	188	191	195	199	203	206	210	214	218	221
60	225	229	233	236	240	244	248	251	255	259
70	263	266	270	274	278	281	285	289	293	296
80	300	304	308	311	315	319	323	326	330	334
90	338	341	345	349	353	356	360	364	368	371
100	375	379	383	386	390	394	398	401	405	409
110	413	416	420	424	428	431	435	439	443	446
120	450	454	458	461	465	469	473	476	480	484
130	488	491	495	499	503	506	510	514	518	521
140	525	529	533	536	540	544	548	551	555	559
150	563	566	570	574	578	581	585	589	593	596
* 160	600	604	608	611	615	619	623	* 626	630	634
170	638	641	645	649	653	656	660	664	668	671
180	675	679	683	686	690	694	698	701	705	709
190	713	716	720	724	728	731	735	739	743	746
200	750	754	758	761	765	769	773	776	780	784

Time in minutes indicated here

* Illustration of use.
PROBLEM. What is the TDIS of a vehicle moving between points A and B, which are 167 kilometers apart, at a rate of 16 kilometers per hour?
ANSWER: Enter left-hand column at 160, move across to the vertical line under 7, and read the TDIS of 626 minutes directly from the table.

(3) The factors considered in computing time for an infantry division to complete a march and to make preparations for launching a coordinated attack are dependent on whether the march is made by echelon or completed in one trip. The time factors in (*a*) through (*d*) below apply only when the march is made by echelon. The time factors in (*e*) through (*i*) below apply to any motor move and outline the procedure used in determining the earliest time at which an infantry division can launch a coordinated attack. These factors are based on the assumption that the infantry division can launch a coordinated attack when each of the brigades participating in the coordinated attack is in position behind the line of departure (LD). Since the closing of these brigades requires more time than the preparation and movement of the other forces, supporting units, such as artillery, reserve, etc, will be in position before closing of the brigades on the LD. The factors are further based on the assumption that these assault forces will be the leading elements of the road movement serials.

(*a*) Dump basic loads: day—15 minutes; night—30 minutes.

(*b*) Load basic loads: day—30 minutes; night—60 minutes.

(*c*) Reassemble trucks for each trip made in convoy: day—20 minutes; night—40 minutes.

(*d*) Entruck personnel: day—10 minutes; night—20 minutes.

(*e*) Complete the motor march from the old area to the new area: see above.

Note. If the release point (RP) is 5 kilometers or less from the detrucking point (DP), TDIS will be the time to complete the move from the SP to the RP. Any consideration of time consumed in moving by motor from the RP to the DP in the new area is included in the time factors given in (*g*) below. If the distance is more than 5 kilometers from the RP to the DP, the time to traverse this distance must be added to the time required to complete the move from the SP to the RP before considering the time factor for detrucking troops in (*f*) below.

(*f*) Detruck, reform foot troops: day—5 minutes; night—10 minutes.

(*g*) Organization and movement in the new assembly area before troops reaching the foot SP's for the foot march to the LD. (This includes movement from the RP as outlined in (*e*) above as well as time to issue any additional rations or ammunition carried in each truck transporting troops.): day—30 minutes; night—60 minutes.

(*h*) Time to move from foot SP's in the new area to LD (TDIS of foot march): see paragraph 4–8*e*(1).

(*i*) Time for final preparation after the leading man reaches the LD and before launching a coordinated attack: day—60 minutes; night—90 minutes. (This factor includes time to close foot troops behind the LD, time to reconnoiter, issue orders in subordinate units, and emplace and register infantry weapons where necessary.)

h. Average Time Factors—Armored Division.

(1) These data pertain to G3 time factors considered after an armored division receives a movement order. They give the times required by the command for—

(*a*) Making preparations before the leading vehicle can arrive at the SP.

(*b*) Completing the motor march and making preparations to launch a coordinated attack.

(2) The preparations before the leading vehicle can arrive at the SP are less time consuming than those in the infantry division because the armored division is able to move the entire division by organic vehicles. Preparations include transmission of orders by division, briefing of troops, and other normal preparations for an anticipated move. It is SOP for armored division vehicles to be refueled and expended ammunition replaced at once whenever a halt is made or any element of the division enters an assembly area. This permits vehicles to move as soon as personnel and equipment are loaded.

(*a*) If the order is received in daylight for a daylight march (e.g., received at 1000), leading vehicle can cross the SP at 1045—¾ hour.

(*b*) If the order is received at night for a night march (e.g., received at 2200), leading vehicle can cross the SP at 2300—1 hour.

(*c*) If the order is received in daylight for a night march (e.g., received at 1100), leading vehicle can cross the SP 30 minutes after evening nautical twilight—30 minutes after evening nautical twilight.

(*d*) If the order is received at night for a daylight march, and more than 1 hour before morning twilight (e.g., received at 0200), leading vehicle can cross the SP at morning nautical twilight—morning nautical twilight. (If order is received less than 1 hour before morning nautical twilight, the time is the time the order is received plus 1 hour.)

(3) The factors considered in computing time for an armored or an infantry (mechanized) division to complete a march and to make preparations for launching a coordinated attack depend on whether the division is organized for combat. The assumption is that the division is organized for combat in anticipation of the move and commitment to battle. The time factors in (*b*) and (*c*) below apply to any move and are based on the assumption that the armored division can launch a coordinated attack when two task forces (equivalent of one infantry battalion and one tank battalion) of each brigade are in position to attack. If the division formation is a column of brigades, only the time factors for the leading brigade are computed. If the division formation is brigades abreast, the time factors for the brigade with the greatest distance to traverse are computed as the factors for the entire division. If the division is not organized for combat, time must be allowed (as included in (*a*) below) to permit battalions and supporting units to assemble under a brigade and organize into task forces under the brigade commander. Other commands, such as the brigade in reserve, division troops, division artillery, DISCOM, and units placed in division troops, can be assumed to complete their organization in less time than a brigade and, therefore, are not included as a factor. The organization of brigades and task forces may be partially or entirely completed either in bivouac, assembly area, or attack position or a combination thereof. The time factor, however, remains the same.

(*a*) Organize brigades and task forces. (In either one or combination of bivouac, assembly area, and attack position.): day—45 minutes; night—90 minutes.

(*b*) Complete march from old area to new area: (3) above.

(*c*) Time for final reconnaissance, refueling, and preparations to cross the LD or leave attack position (may be a combined assembly area and attack position): day—30 minutes; night—60 minutes.

i. Road Movement Graph.

(1) A road movement graph is the simplest method of obtaining data required for a road movement table or order. It shows the approximate location at any hour of the head or tail of each serial, provided the road movement proceeds as scheduled. The vertical scale to the left, with point of origin at the bottom, serves as a distance scale in kilometers and should show the relative locations, along the route, of critical points where coordination of the movement is required. The horizontal scale provides a time scale in hours, beginning at the left with the earliest hour at which the first serial may start the march.

(2) A serial is represented graphically by drawing a line to represent the movement of the head of the serial and a line to represent the movement of the tail of the serial. The lines are parallel and are drawn with a slope that represents the rate of march. (At 10 kilometers per hour, the slope equals 10 kilometers on the vertical to 1 hour on the horizontal scale.)

(3) *Example of road movement graph.*

(*a*) The 1st Infantry Division commander has directed that elements of the DISCOM and the 3d Brigade move under cover of darkness from their present bivouacs, areas A and B, to areas C and D. Foot troops and motor vehicles will move during the night 16–17 October. Movement is to begin 161900 October and is to be completed 170430 October.

(*b*) An example of a road movement graph is given in figure 4–5.

j. Road Movement Table. A road movement table (table 4–15) is an annex to the march or operation order. The road movement table contains information and instructions concerning the march serials involved in the movement; their serial numbers, rates of march, routes, SP's; times of crossing the SP's, RP's, critical points; times of arrival at or departure from critical points; and other pertinent details. This information is usually obtained from an accurate knowledge of the status of routes and units and from a road movement graph (fig. 4–5). If desired, planners may determine some of the information contained in the road movement table by march calculations. The road movement table usually consists of two parts—a data paragraph reflecting general information, or information common to two or more serials; and a tabular list of the march serials, together with all other necessary information regarding them. Road movement tables frequently require a wider distribution than a march or operation order so that copies can be issued to movement control personnel, MP traffic posts, etc.

k. Strip Map. A strip map (fig. 4–6) is a schematic sketch of the routes of march that contain useful information concerning them. The division or brigades should include a strip map as an annex to the unit march order. It is particularly useful to small-unit commanders for organizational control. Using units should reproduce strip maps in quantity and supply them to key personnel, particularly to vehicle commanders and route markers.

l. Vehicle Availability Table. The vehicle availability table (table 4–16) is useful in planning the movement of an infantry division in its own organic transportation. It helps the transportation officer make a plan for drawing 2½- or 5-ton trucks from subordinate units of the division in accordance with their ability to furnish them. The table lists across its top all the subordinate units of the division except the cavalry squadron. The table omits this unit because its vehicles are not normally available. In column 1 the 2½- and 5-ton trucks of the division are divided into priorities of availability according to their normal uses. When the transportation officer levies units for trucks, he will deplete each priority, starting with the highest, until he obtains the required number of vehicles. The table does not show all the 2½- and 5-ton trucks of the division. The table omits the prime movers, maintenance vehicles, command and fire control vehicles, and essential signal communications vehicles because these vehicles do not haul general cargo or transport troops or other units. For any given move the number of vehicles actually available will vary because of deadlined trucks, combat losses, and restrictions applicable to the move under consideration. Using the vehicle availability table and the troop strengths of the units requiring additional transportation, the planner can quickly and adequately determine the number and source of vehicles required for the march.

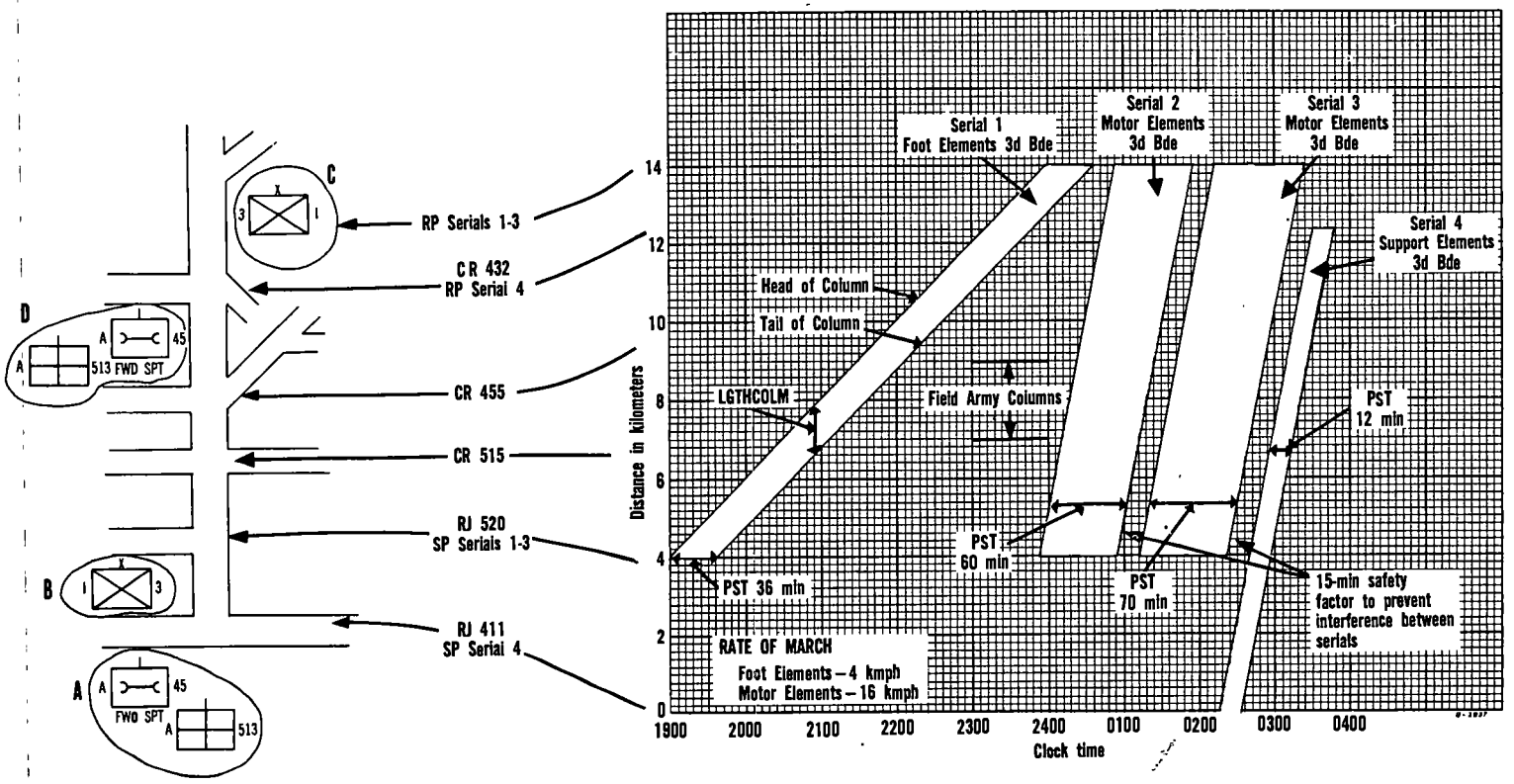


Figure 4–5. Example of a road movement graph.

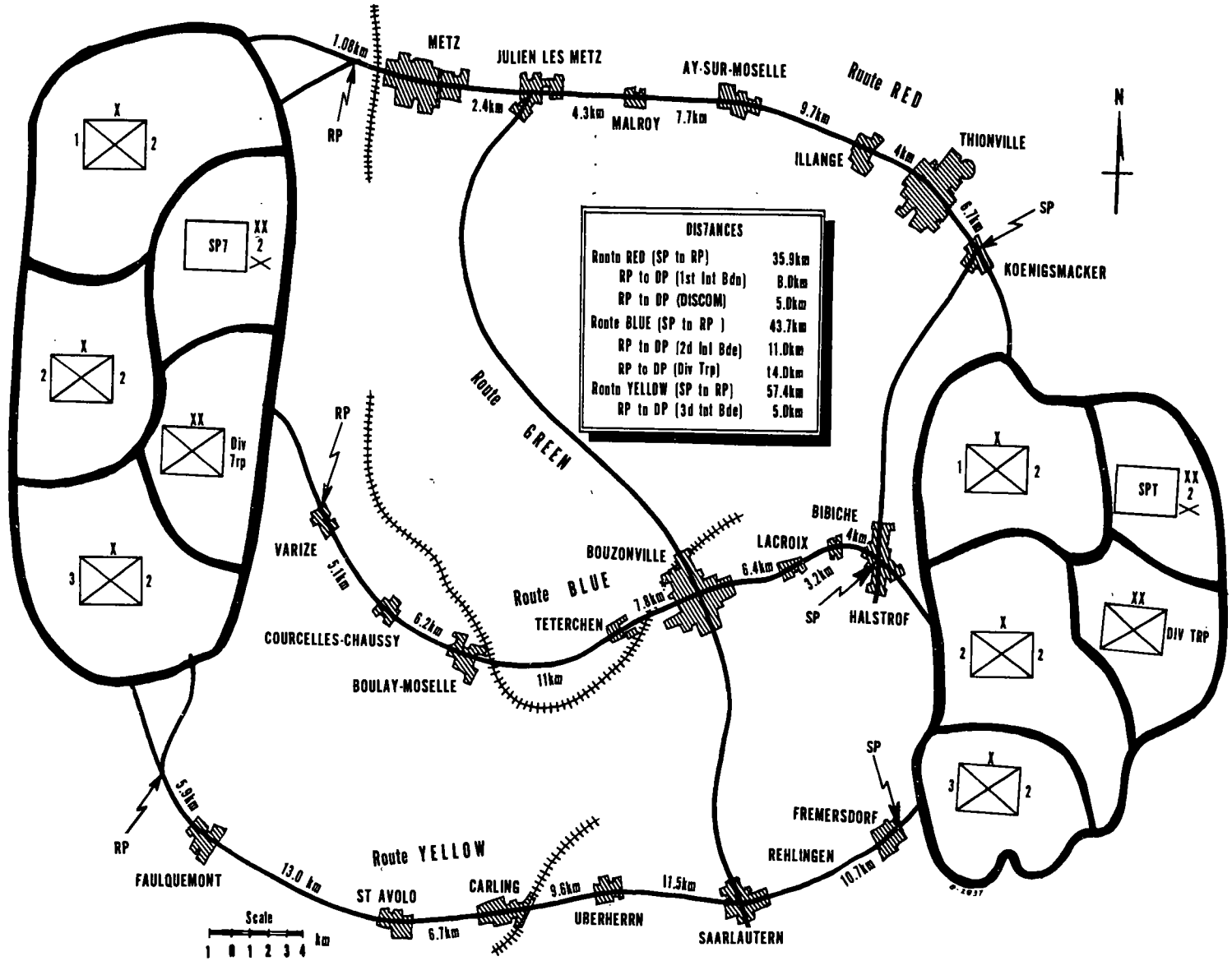


Figure 4–6. Example of a strip map.

Table 4–15. Example of a Road Movement Table.

(Classification)

Annex_____ (Road Movement Table) to OPORD_____ Normal OPORD heading
Reference: Map***.
1. Average or maximum speed.
2. Traffic density (type of march column).
3. Halts.
4. Routes between SP's and RP's.[1]
5. Critical points.[1]
   a. SP's.
   b. RP's.
   c. Other critical points.
6. Main routes to SP's.[1]
7. Main routes from RP's.[1]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Serial	Date[3]	Organization and commander	Number of vehicles	Load class of heaviest vehicles	Present location[3]	Route[1]	New location[3]	Route to SP	PST (min)	Control of movement: Location of critical points[4]	Control of movement: Arrival time	Control of movement: Clearance time	Route from RP	Remarks
1	(***)	2d Inf Div COL Dall 1st Bde Comdr	(***)	(***)	SAARBURG area	RED	METZ area	(***)	75	SP RJ (THIONVILLE) METZ RP DP	(***) (***) (***) (***) (***)	(***) (***) (***) (***) (***)	(***)	(***)
*		*			*		*			*	*			*
4	(***)	Div Trp COL Kraft Div Arty Comdr	(***)	(***)	SAARBURG area	BLUE	METZ area	(***)	154	SP BIBICHE Bridge RJ (BOUZONVILLE) RP DP	1920 1936 2000 2112 2144	2150 2206 2220 2342 0014	(***)	(***)
5	(***)	2d Inf Div COL Walsh 3d Bde Comdr	(***)	(***)	SAARBURG area	YELLOW	METZ area	(***)	75	SP RJ (SAARLAUTERN) RJ (ST AVOLD) RP DP	(***) (***) (***) (***) (***)	(***) (***) (***) (***) (***)	(***)	(***)

Acknowledge[5]
Appendixes
Distribution
Authentication

Commander[5]

(Classification)

[1] Routes and points are described in the data paragraphs by grid references, code words, etc., and, if necessary, numbered or lettered for ease of reference in the columns of the table.
[2] Only the minimum number of columns of the table should be used.
[3] Since the table may be issued to personnel concerned with control of traffic, the security aspect must be remembered. It may not be desirable to include dates or locations.
[4] Critical point is defined as a selected point along a route used for reference in giving instructions. It includes SP's, RP's and other points along a route where interference with movements may occur.
[5] If the table is issued by itself, and not as an annex to a more detailed order, the table must be signed or authenticated in the normal way.

Table 4–16. Example of a Vehicle Availability Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Priority	Normal use	1st Bde/ 20th Inf Bde	2d Bde/ 20th Inf Bde	3d Bde/ 20th Inf Bde	HHB/ 20th Inf Div Arty	1–45 Arty	1–46 Arty	1–47 Arty	1–48 Arty	1–49 Arty	1–439 Arty (C/V)	20th Engr	1–2 Armor	HHC/ 20th Inf Div	1–21 Cav	20th Sig*	20th MP Co	20th Inf DISCOM	20th Avn	Tota div
		Max/Aval																		Max/Aval
1	Sup and gen cgo	3/	3/	3/	3/	3/	3/	3/	3/	3/	4/	5/	15/	0/	0/	0/	0/	6/	0/	57/
2	Org equip	0/	0/	0/	7/	9/	9/	9/	9/	9/	8/	10/	7/	1/	7/	6/	0/	9/	10/	110/
3	Ki trk	7/	7/	7/	1/	3/	3/	3/	3/	3/	3/	6/	6/	1/	1/	1/	1/	3/	1/	60/
4	Engr tool and brg.	4/	4/	4/	0/	0/	0/	0/	0/	0/	0/	57/	0/	0/	0/	0/	0/	0/	0/	69/
5	Ammo trk	11/	11/	11/	0/	10/	10/	10/	10/	10/	0/	0/	9/	0/	0/	0/	0/	0/	0/	92/
6	Sig comm	0/	0/	0/	3/	0/	0/	0/	0/	0/	0/	1/	0/	0/	0/	0/	0/	0/	0/	4/
	Total	25/	25/	25/	14/	25/	25/	25/	25/	25/	15/	79/	37/	2/	8/	7/	1/	18/	11/	392/

*Sig bn veh shown are those without shifters or sig equip installed thereon.

Maximum availability | / | Current availability

m. Vehicle Assignment Table. The vehicle assignment table (table 4–17) shows from which units planners can draw the 2½- or 5-ton trucks (colm 1) and to which units they can assign these trucks (colm 2–6) for the move. The basis for this table is the vehicle availability table (table 4–16).

n. March Calculator. A march calculator (fig. 4–7) is a special form of slide rule. The user can read the desired LGTHCOLM or PST of any unit from the calculator provided he knows the number of vehicles in the unit column. The calculator readings include the LGTHCOLM's or the time (gaps) between march units but not those between march serials of battalion, task force, or brigade size. When using the calculator to determine the LGTHCOLM's or PST's of two or more brigades, the planner adds to the readings a 15-minute time gap (or equivalent LGTHCOLM) for each gap between march serials of brigade size, plus a 5-minute time gap (or equivalent LGTHCOLM) for each gap between subordinate march serials of battalion or task force size. The time gaps between march units of company, battery, or troop size are built into the readings of the calculator.

4–11. Motor Movement by Echelon

a. Definition. Motor movement by echelon is a movement in which a unit, such as an infantry division, lacking sufficient organic transportation to move all its personnel and equipment in one trip, uses a portion of its transportation to move its foot troops and essential supplies (by complete tactical units) in successive trips until it has completed the entire movement.

b. Sequence. The sequence of events in terms of time consumed is as follows:

(1) Preparation time (first echelon).
(2) TDIS (each route).
(3) PST (close entire first echelon).
(4) Unloading.
(5) Reassembly.
(6) TDIS (each route).
(7) PST (returning trucks).
(8) Loading.
(9) Reassembly (head of column at SP).
(10) TDIS (each route).
(11) PST (close entire second echelon).

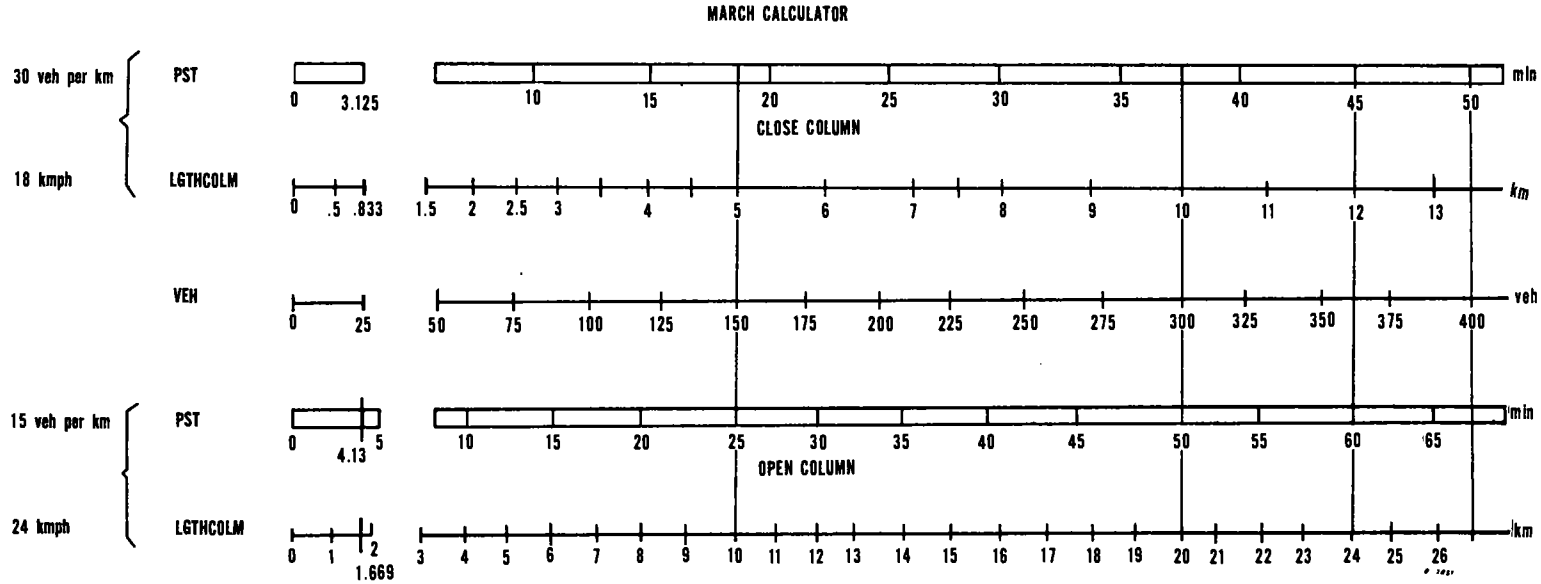
c. Basic Principles. Although planners must use vehicles to the maximum in a movement by echelon, they must observe certain basic principles if they are to maintain the combat efficiency of the division. For example—

(1) In levying units for transportation, exclude weapon vehicles; prime movers; maintenance trucks; and essential command, reconnaissance, and signal communications vehicles. Units must retain their battlefield mobility and effectiveness.

(2) Leaving sufficient ammunition vehicles with units moved in the first echelon enables these units to conduct operations until supply can be instituted. Preferably, these units have the use of all their ammunition vehicles. However, they normally can retain at least two-thirds of them.

Table 4–17. Example of a Vehicle Assignment Table

	1	2	3	4	5	6
1	Unit that furnishes transport	1st echelon			2d echelon	
		1st Bde	2d Bde	3d Bde	Sig bn	Other elements
2	1st Bde			22		
3	2d Bde			20		
4	3d Bde	18				
5	1–1 Armor					5
6	1–2 Armor				5	
7	1–45 Arty					6
8	1–46 Arty					7
9	20th S&T	45				
10	20th Engr		45			
11	20th Sig		18			
12	Total	63	63	42	5	18



INSTRUCTIONS

1. To find LGTHCOLM and PST of any unit, set edge of slide rule at number of vehicles in that unit and read LGTHCOLM and PST on the appropriate scale above or below.
2. For composite groupings add vehicles and read as in 1 above.
3. When vehicles in column exceed 400, compute for one-half of total and double the answer.
4. Figures are based on latest TOE's.
5. Readings include LGTHCOLM and time gaps between march units but not between march serials of battalion, task force, or brigade size.
6. When using the calculator to determine LGTHCOLM's or PST's of two or more brigade-size units, add to readings a 15-minute time gap (or equivalent LGTHCOLM) for each gap between these march columns. When brigades are divided into subordinate battalion task force size serials, add a 5-minute time gap (or equivalent LGTHCOLM) for each gap between subordinate serials. The normal 2-minute time gaps between company-, battery-, or troop-size march units are included in the readings shown in the scales of this calculator.

Figure 4-7. Example of a march calculator.

(3) Normally, provision is made for the field trains to march with their parent organizations. Field trains consist of kitchen, baggage, and administrative vehicles and those vehicles, such as fuel, medical, and maintenance vehicles, that are not part of the combat trains. On arrival in the new area, field train vehicles in the first echelon, assigned for movement of the second echelon, dump their basic loads and return to assist in moving that echelon.

(4) Dumping of the basic loads of a large number of vehicles in the forward area is avoided.

(5) Vehicles taken from a unit operate as a group whenever possible to facilitate control and maintenance by the parent unit.

(6) Vehicles from other elements of a unit move the foot troops of that unit whenever possible. Similarly, vehicles from units usually associated in a normal combat grouping should move the foot troops of that grouping.

(7) Only 2½- or 5-ton trucks, including dump trucks, unless otherwise prescribed, move foot troops.

d. SOP. Because motor movement by echelon requires careful planning, the division should have several plans in the form of SOP's. Time for planning such moves will nearly always be short. In such situations, to modify an existing plan is much quicker than to prepare an entirely new one. SOP plans should contain—

(1) A plan number.

(2) A standard composition for the division security force.

(3) Standard composition and duties of the quartering (advance) party.

(4) The units to move in each echelon.

(5) Organization of columns.

(6) The assignment of vehicles to move foot troops and impedimenta, showing the unit from which obtained and the unit to which assigned for the move.

(7) Adequate provisions for signposting and traffic control.

e. Time Formula. When time precludes detailed planning, such as outlined above, the following formula may be useful in rapidly estimating the total time of such a movement:

$$\text{Hours required} = \frac{\text{number of trips} \times \text{distance in km}}{\text{rate of march in km in the hr}} + T$$

(1) The "number of trips" is the number of trips in either direction; e.g., in a two-echelon movement, three trips would be required—one forward trip to move foot troops, a return trip, and a second trip forward for the remainder of troops and organic loads.

(2) T (a variable) represents the number of hours consumed in unloading and loading personnel and equipment, in turnarounds at forward and rear assembly areas, and in closing the column into its destination area. When two routes are available and the movement is in close column in two echelons, a value of 6 may be assumed for T as giving a reasonable factor for safety. When more than two routes are available, the value of T may be reduced.

(3) "The rate of march in km in the hr" represents the average speed of the vehicles in the movement over a time, including short halts.

4–12. Movement by Air Force Aircraft

a. General.

(1) The tables in this paragraph may be used as a general guide to determine the aircraft requirements, by type of Air Force transport aircraft, for air movement of divisional and nondivisional units that might be in a typical field army (para 4–2). For aircraft requirements for air movement of airborne or airmobile units thereof, see FM 57–1, FM 57–35, and FM 61–100. For data to compute aircraft requirements to transport Army aircraft in Air Force transport aircraft, see paragraph 7–39*e*. Tables 4–18 through 4–23 are based on data compiled for a theoretical situation that assumes full TOE strength and complete TOE equipment. In applying these tables to actual air movement, the user must remember that the required lift for any unit will fluctuate with the personnel and equipment status of that unit and with the allowable cargo load of the aircraft for the specific operational conditions of the air movement. The tables show numbers of aircraft load; i.e., the number of sorties, by type of aircraft, required to move a particular unit. Fewer aircraft than shown may transport the unit if part or all of the aircraft fly more than one sortie.

(2) The air movement of a large body of troops normally involves departures from several airfields and, in air-landed operations, concurrent landing at several terminal airfields, airlanding facilities, or landing zones in the objective area. The availability of transport aircraft, air installations, and base facilities; the urgency of the situation; and enemy capabilities are major factors in determining the number of installations employed as well as the number of sorties to be flown by the transporting aircraft. For general considerations and procedures governing the employment of air transportation, see FM 100–5 and FM 101–5. For specific information regarding load planning, determination of aircraft requirements, and forms relative to air movement, see TM 57–210.

b. Aircraft Requirement—Field Army.

(1) *General.* The tabulated data in (4) below represent aircraft requirements for selected units of a typical field army. These data are a guide only in planning for airborne operations or the administrative air movement of units of a typical field army.

(2) *Equipment and supplies.* Columns in the tables indicate the total weight of each unit in short tons (STON). This figure is the sum of the weights of TOE personnel, TOE equipment, and required supplies.

(*a*) *TOE personnel and equipment.* Unless otherwise indicated, all units are moved at 100-percent personnel and equipment TOE strength. Planners use an average weight of 240 pounds per individual in determining total personnel weight for a unit. They determine weights of vehicles by using net weights given in applicable technical manuals.

(*b*) *Supplies.* The major classes of supply are I, III, III(A), and V. The accompanying class II and IV supplies are limited to critical items based on a 15-day requirement.

1. Class I supply is based on 5 days to accompany each unit, with an average of 6.6 pounds per man per day.

2. Class III and class III(A) supply are based on the weight of petroleum, oils, and lubricants (POL) required to operate ground and air vehicles a minimum of 5 days. Class III requirements for other equipment are established on a reasonable hourly operational basis for 5 days.

3. Class V supply weights are based on the basic load for all units adjusted to a reasonable rate of expenditure to reflect 5 days of class V supply.

(3) *Aircraft requirements.*

(*a*) Aircraft requirements listed in the tables below reflect the number of sorties required to transport the various units.

(*b*) The following assumed allowable cargo loads (2,000 nautical-mile range) are the bases for aircraft requirements:

	Pounds
C–130 medium transport airplane	30,000
C–124 heavy transport airplane	35,000
C–141 heavy transport airplane	70,000

(*c*) In determining aircraft requirements, the "type load method" (TM 57–210) has been used. Units have been loaded administratively rather than tactically.

(*d*) Air Force troop carrier units providing aircraft for the operation being considered will announce to the Army component of the airborne force the allowable cargo load for each type of aircraft to be employed; the allowable cargo load will vary with the distance of flight and other operational conditions.

(*e*) In any airborne operation it may be necessary to use types of aircraft other than those listed. However, the data given will serve as a basis for adaptation of the units to be moved to the types of aircraft that are available.

(*f*) One column in the tables indicates three types of combinations of aircraft. Other types of combinations may be necessary.

1. Combination 1 consists of C–130's and C–124's. In determining aircraft requirements for this combination, the minimum required number of C–124's has been used, i.e., items of equipment that cannot be carried in C–130's have been loaded in C–124's. After filling typical loads for the C–124's, the remainder of the unit's personnel, equipment, and supplies has been loaded into C–130's. The assumption is that all equipment considered in the three sample combinations is fully assembled. There is an allowance for 9-inch clearances on both sides and on top of loads at the door section.

2. Combination 2 consists of C–124's only.

3. Combination 3 consists of C–141's and C–124's. The minimum number of C–124's to take care of loads not capable of being loaded on the C–141 has been employed. The remainder of the loads has been loaded into C–141's.

4. TOE items of equipment that are not air transportable by any of the three available types of aircraft as a result of either size or weight limitations are marked by an "X" in the last column of the tables. Table 4–23 lists these items.

(*g*) In selecting aircraft or combinations of aircraft to transport a unit, the planner must carefully consider the primary mission of the unit and the requirement for the unit in the objective areas. During the initial stages of an airborne assault, units transported to the objective area will use a combination of parachute and assault aircraft. Following the initial assault and after units have prepared landing facilities, medium transport aircraft can perform an air-landed role. When facilities are developed sufficiently to handle heavy transport aircraft, units requiring this means of transportation can come into the objective area.

(*h*) For supplemental classified data on airlift requirements for field artillery units with nuclear capabilities, AD units, and nuclear weapon and missile support units, see FM 101–10–3, chapter 4.

(4) *Tabulated requirements.* It will be noted in tables 4–18 through 4–23 that when combinations of units are moved savings on total aircraft requirements can be accomplished. These tables reflect the minimum aircraft necessary to move each indicated unit, independent of any other unit.

Table 4–18. Command and Control Units, Field Army—Aircraft Requirements.

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C–130	6 C–124	7 C–141
2	HHC, spt gp	29–102G	103.9	1	8		
				2		6	
				3			4
3	HHC, army	51–1G	230.7	1	16		
				2		11	
				3			9
4	HHC, corps	52–1T	72.7	1	6		
				2		5	
				3			4
5	HQ and sp trp, FASCOM	54–12T	129.1	1	9	1	
				2		8	
				3		1	6
6	HHC, spt bde, army	54–22T	72.3	1	6		
				2		5	
				3			4
7	HHC, spt bde, corps	54–22T	72.3	1	6		
				2		5	
				3			4

Table 4-19. Divisions—Aircraft Requirements

a. Infantry Division Base

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON) Trans	4 Weight of pers equip and sup (STON) Nontrans	5 Type of acft combination	6 Acft requirements C-130	7 Acft requirements C-124	8 Acft requirements C-141	9 Nonair-trans items (see table 4-23)
2	Div HHC	7-4G			1	16			
			252		2		13		
					3			8	
3	MP co	19-27G			1	12			
			182		2		10		
					3			6	
4	Avn bn	1-75G	600	236	1	23	12		X
					2		30		
					3		11	11	
5	Sig bn	11-35G			1	71	14		
			1,439		2		72		
					3		1	41	
6	Engr bn	5-155G	2,190	1,410	1	77	47		X
					2		110		
					3		47	36	
7	Bde HHC	7-42G	863	9	1	46	6		X
					2		44		
					3		3	23	
8	Armd cav sqdn	17-105G	1,663	1,500	1	99	3		X
					2		84		
					3		1	7	
9	Div arty	6-100G	6,019	382	1	341	24		X
					2		301		
					3		13	165	
10	DISCOM	29-1G	3,959	881	1	206	32		X
					2		198		
					3		31	96	
11	ADA bn	44-325T	1,670	94	1	102	3		X
					2		84		
					3		2	47	

Table 4-19. Divisions—Aircraft Requirements—Continued

b. Infantry Division Equipment

1	1	2	3	4	5	6
	Line item number	Item	Weight (STON)	Dimensions (ft)		
				Length	Width	Height
		Avn bn, TOE 1-75G				
2	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
3	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
4	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
		Engr bn, TOE 5-155G				
5	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	15.40	36.30	13.20	13.30
6	C25620	Brg, fltg, mbl, aslt, amph	26.60	36.10	10.00	10.30
7	E56577	CEV, full-tracked (T118E1)	53.00	26.00	12.20	10.90
8	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	30.50	28.50	11.50	12.30
9	R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg	27.10	29.30	10.00	11.70
10	R50680	Recov veh, full-tracked, mdm	54.00	27.24	11.51	9.92
11	S73805	Stlr, van, cgo, 6-ton, 4-wheel, with equip	8.60	27.40	8.20	11.30
12	W76816	Trac, full-tracked, low-spd, diesel, hv DBP, with bulldozer, WWN	24.40	19.60	11.20	7.80
		Div arty, TOE 6-100G				
13	K12718	Hdlg unit, rkt, tlr-mtd, 762-mm, with equip (HJ)	4.90	28.00	8.10	11.10
14	K30645	Hel, ovsn, OH-6A	0.58	30.30	26.33	8.50
15	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
16	K56981	How, hv, SP, 8-in	26.80	22.10	10.50	9.30
17	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70
		Bde HHC, TOE 7-42G				
18	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
		Armd cav sqdn, TOE 17-105G				
19	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
20	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
21	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
22	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70
23	V12826	Tk, cbt, full-tracked, 76-mm gun	21.30	23.07	10.50	10.10
		DISCOM, TOE 29-1G				
24	R50680	Recov veh, full-tracked, mdm, armd	54.40	27.24	11.51	9.92
25	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	21.20	38.50	12.16	8.75
26	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip	7.50	26.91	8.16	11.16
		ADA bn, TOE 44-32ST				
27	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70

Table 4–19. Divisions—Aircraft Requirements—Continued

c. Infantry Division (Mechanized) Base

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON) Trans	4 Weight of pers equip and sup (STON) Nontrans	5 Type of acft combination	6 Acft requirements C–130	7 Acft requirements C–124	8 Acft requirements C–141	9 Nonair-trans items (see table 4–23)
2	Div HHC	37–4G	311.29	7.28	1	16	3		X
					2		16		
					3		3	8	
3	MP co	19–27G	182.00		1	12			
					2		10		
					3			6	
4	Sig bn	11–35G	1,439.00		1	72	14		
					2		72		
					3		1	41	
5	Engr bn	5–145G	2,072.02	957.16	1	107	17		X
					2		104		
					3		17	50	
6	Bde HHC	37–42G	1,919.99	7.24	1	83	29		X
					2		96		
					3		29	39	
7	Armd cav sqdn	17–105G	1,663.00	1,500.00	1	99	3		X
					2		84		
					3		1	42	
8	Div arty	6–300G	6,770.85	2,158.36	1	385	26		X
					2		339		
					3		15	185	
9	DISCOM	29–11G	4,801.16	1,032.27	1	243	43		X
					2		241		
					3		43	113	
10	ADA bn	44–325T	1,670.00	94.00	1	102	3		
					2		84		
					3		2	47	

Table 4-19. Divisions—Aircraft Requirements—Continued

d. Infantry Division (Mechanized) Equipment

1	1 Line item number	2 Item	3 Weight (STON)	4 Dimensions (ft) Length	5 Width	6 Height
		Div HHC, TOE 37-4G				
2	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
3	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
		Engr bn, TOE 5-145G				
4	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	15.35	36.30	13.20	13.30
5	E56577	CEV, full-tracked	53.00	26.00	12.17	10.88
6	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	30.50	28.50	11.50	12.25
7	L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg	45.56	36.25	13.16	13.25
8	R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg	27.00	39.33	10.00	11.66
9	R50680	Recov veh, full-tracked, mdm, armd	54.40	27.24	11.51	9.92
10	W76816	Trac, full-tracked, low-spd, diesel, with bulldozer	24.40	19.63	11.21	7.83
		Div arty, TOE 6-300G				
11	K12718	Hdlg unit, rkt, tlr-mtd, 762-mm, with equip (HJ)	4.90	28.00	8.10	11.10
12	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
13	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
14	K56981	How, hv, SP, 8-in	26.80	22.10	10.50	9.30
15	K57666	How, mdm, SP, 155-mm	24.70	20.02	10.81	9.16
16	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70
17	R50680	Recov veh, full-tracked, mdm, armd	54.40	27.24	11.51	9.92
		Armd cav sqdn, TOE 17-105G				
18	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
19	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
20	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
21	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70
22	V12826	Tk, cbt, full-tracked, 76-mm gun	21.30	23.07	10.50	10.10
		DISCOM, TOE 29-11G				
23	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
24	R50680	Recov veh, full-tracked, mdm, armd	54.40	27.24	11.51	9.92
25	S72983	Stlr, tk, fuel-svc, 5,000-gal	6.90	31.11	8.06	8.97
26	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	21.20	38.50	12.16	8.75
27	T18221	Shop set, acft maint, fxd base, set A	525.00			
		Bde HHC, TOE 37-42G				
28	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50

Table 4–19. Divisions—Aircraft Requirements—Continued

e. Armored Division Base

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON) Trans	4 Weight of pers equip and sup (STON) Nontrans	5 Type of acft combination	6 Acft requirements C-130	7 Acft requirements C-124	8 Acft requirements C-141	9 Nonair-trans items (see table 4–23)
2	Div HHC	17–4G	322. 44		1	18	2		
					2		17		
					3		2	9	
3	MP co	19–27G	182. 00		1	12			
					2		10		
					3			6	
4	Sig bn	11–35G	1, 439. 00		1	72	14		
					2		72		
					3		1	41	
5	Engr bn	5–145G	2, 072. 02	957. 16	1	107	17		X
					2		104		
					3		17	50	
6	Bde HHC	17–42G	1, 650. 94	64. 02	1	102			X
					2		83		
					3			48	
7	Armd cav sqdn	17–105G	1, 663. 00	1, 500. 00	1	99	3		X
					2		84		
					3		1	42	
8	Div arty	6–300G	6, 770. 85	2, 158. 36	1	385	26		X
					2		339		
					3		15	185	
9	DISCOM	29–21G	7, 735. 60	1, 430. 91	1	346	106		X
					2		387		
					3		105	162	
10	ADA bn	44–325G	1, 670. 00	94. 00	1	101	3		X
					2		84		
					3		2	47	

Table 4-19. Divisions—Aircraft Requirements—Continued

f. Armored Division Equipment

1	1	2	3	4	5	6
	Line item number	Item	Weight (STON)	Dimensions (ft)		
				Length	Width	Height
		Engr bn, TOE 5-145G				
2	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	15.35	36.30	13.20	13.30
3	E56577	CEV, full-tracked	53.00	26.00	12.17	10.88
4	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	30.50	28.50	11.50	12.25
5	L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg	45.56	36.25	13.16	13.25
6	R11462	Ramp, loading, veh, mbl aslt, amph, fltbrg	27.00	39.33	10.00	11.66
7	R50680	Recov veh, full-tracked, mdm, armd	54.40	27.24	11.51	9.92
8	W76816	Trac, full-tracked, low-spd, diesel, with bulldozer	24.40	19.63	11.21	7.83
		Div arty, TOE 6-300G				
9	K12718	Hdlg unit, rkt, tlr-mtd, 76-mm, with equip (HJ)	4.90	28.00	8.10	11.10
10	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
11	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
12	K56981	How, hv, SP, 8-in	26.80	22.10	10.50	9.30
13	K57666	How, mdm, SP, 155-mm	24.70	20.02	10.81	9.16
14	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70
15	R50680	Recov veh, full-tracked, mdm, armd	54.40	27.24	11.51	9.92
		Bde HHC, TOE 17-42G				
16	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
17	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.00
		Armed cav sqdn, TOE 17-105G				
18	K30645	Hel, obsn, OH-6A	0.58	30.30	26.33	8.50
19	K31749	Hel, util, UH-1B	2.28	53.00	9.30	14.70
20	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
21	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70
22	V12826	Tk, cbt, full-tracked, 76-mm gun	21.30	23.07	10.50	10.10
		DISCOM, TOE 29-21G				
23	K31786	Hel, util, UH-1D	2.35	57.08	9.33	14.46
24	Q53741	Radio set, AN/VRC-46, mtd in TRV	54.00	27.24	11.51	9.92
25	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	38.50	12.16	8.75	21.20
26	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip	26.91	8.16	11.16	7.50
27	T18221	Shop set, acft maint, fxd base, set A	525.00			
28	T21235	Shop set, acft maint, stlr-mtd, A-1, toolcrib, elec flaw detection	27.32	8.11	11.25	10.64
29	T21372	Shop set, acft maint, stlr-mtd, A-2, sheetmetal welding hyd	27.32	8.11	11.25	10.95
		ADA bn, TOE 44-325G				
30	R50543	Recov veh, full-tracked, lt, armd	23.80	21.78	10.50	9.70

Table 4–20. Combat Units—Aircraft Requirements

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C–130	6 C–124	7 C–141	8 Nonair-transportable items (see table 4–23)
	Sep bde base							
2	Sep inf bde	7–100G	5, 109. 6	1	220	43		X
				2		216		
				3		42	110	
3	HHC	7–102G	309. 9	1	17	4		
				2		16		
				3		4	8	
4	Armd cav trp	17–107G	705. 7	1	23	5		X
				2		23		
				3		5	12	
5	Avn co	1–47G	195. 6	1	12	1		
				2		10		
				3		1	6	
6	Engr co	5–107G	1, 259. 9	1	23	10		X
				2		29		
				3		10	12	
7	FA bn, 105-mm, towed	6–185G	924. 0	1	57	3		
				2		47		
				3		3	28	
8	Spt bn	29–135G	1, 714. 5	1	88	20		X
				2		91		
				3		19	44	
9	HHD	29–76G	71. 4	1	5			
				2		5		
				3			3	
10	Admin co	12–177G	61. 2	1	5	1		
				2		4		
				3		1	2	
11	Med co	8–147G	185. 6	1	13			
				2		10		
				3			6	
12	S&T co	29–77G	669. 1	1	33	8		
				2		35		
				3		8	16	
13	Maint co	29–99G	727. 2	1	32	11		X
				2		37		
				3		10	17	
14	Sep armd bde	17–100G	4, 780. 7	1	262	42		X
				2		229		
				3		42	126	
15	HHC	17–102G	481. 4	1	24	7		
				2		25		
				3		7	12	
16	Armd cav trp	17–107G	705. 8	1	23	5		X
				2		23		
				3		5	12	
17	Engr co	5–127G	1, 201. 0	1	20	28		
				2		44		
				3		28	10	
18	FA bn, 105-mm, SP	6–385G	1, 330. 5	1	52	27		X
				2		68		
				3		27	26	

Table 4-20. Combat Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	Sep bde base—Continued							
19	HQ, H&S btry	6-386G	490.5	1	22	6		X
				2		23		
				3		6	11	
20	3 FA btry (each)	6-347G	280.0	1	10	7		X
				2		15		
				3		7	5	
21	Spt bn	29-75G	1,717.8	1	76	17		X
				2		69		
				3		17	37	
22	HHD	29-76G	71.4	1	5			
				2		5		
				3			3	
23	S&T co	29-77G	669.1	1	33	8		
				2		35		
				3		8	16	
24	Maint co	29-79G	730.3	1	23	9		X
				2		28		
				3		9	12	
25	Med co	8-147G	185.6	1	13			
				2		10		
				3			6	
26	Admin co	12-177G	61.2	1	5	1		
				2		4		
				3		1	2	
27	Sep inf bde (mech)	37-100G	5,165.7	1	200	64		X
				2		220		
				3		64	97	
28	HHC	37-102G	438.2	1	21	1		
				2		22		
				3		1	10	
29	Armd cav trp	17-107G	705.7	1	23	5		X
				2		23		
				3		5	12	
30	Engr co	5-127G	805.8	1	20	28		
				2		44		
				3		28	10	
31	Spt bn	29-75G	1,717.7	1	76	17		X
				2		69		
				3		17	37	
32	FA bn 155-mm, SP	6-375G	1,498.3	1	85	8		X
				2		74		
				3		8	41	
33	HHB	6-376G	278.5	1	12	5		
				2		13		
				3		5	7	
34	3 FA btry (each)	6-367G	277.4	1	18	1		X
				2		15		
				3		1	9	
35	Svc btry	6-369G	387.6	1	23	1		X
				2		19		
				3		1	12	

Table 4-20. Combat Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	Inf units							
36	Inf bn, sep inf bde	7-15G	609.1	1	41	8		
				2		31		
				3		8	21	
37	HHC	7-16G	407.2	1	26	2		
				2		21		
				3		2	12	
38	3 rifle co (each)	7-18G	67.3	1	5			
				2		4		
				3			4	
39	Inf bn (mech), sep bde	7-45G	608.1	1	38	30		X
				2		59		
				3		30	19	
40	HHC	7-46G	395.9	1	19	4		X
				2		18		
				3		4	10	
41	3 rifle co (each)	7-47G	69.3	1	8	9		X
				2		15		
				3		9	5	
42	Inf LRP co	7-157G	193.4	1	14			
				2		11		
				3			7	
43	Inf sct dog plat	7-167G	34.0	1	3			
				2		3		
				3			2	
44	Inf pfdr plat, abn	7-168G		1	1			
				2		1		
				3			1	
	Armor units							
45	Tk bn, sep bde	17-35G	4,223.0	1	62	14		X
				2		62		
				3		14	30	
46	HHC	17-36G	1,159.4	1	36	13		X
				2		41		
				3		13	17	
47	3 tk co (each)	17-37G	1,021.2	1	9	1		X
				2		8		
				3		1	5	
48	Armd cav regt	17-51G	11,698.8	1	412	82		
				2		406		
				3		82	197	
49	HHT	17-52G	366.1	1	15	6		X
				2		18		
				3		6	8	
50	Air cav trp	17-58G	199.9	1	13	1		
				2		11		
				3		1	7	
51	3 armd cav sqdn (each)	17-55G	3,710.7	1	129	25		X
				2		127		
				3		25	62	
52	HHT	17-56G	795.6	1	35	9		X
				2		36		
				3		9	17	

Table 4-20. Combat Units—Aircraft Requirements—Continued

1	2	3	4	5	6	7	8
1 Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements C-130	C-124	C-141	Nonair-transportable items (see table 4-23)
Armor units—Continued							
53 3 armd cav trp (each)	17-57G	611.6	1	31	5		X
			2		30		
			3		5	16	
54 Tk co	17-27G	1,023.6	1	9	2		X
			2		8		
			3		2	4	
55 FA btry 155-mm, SP	6-37G	392.7	1	16	1		X
			2		13		
			3		1	8	

Table 4-21. Combat Support Units—Aircraft Requirements

1	2	3	4	5	6	7	8
1 Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements C-130	C-124	C-141	Nonair-transportable items (see table 4-23)
FA units							
2 HHB, FA gp	6-401G	161.7	1	10			
			2		7		
			3			5	
3 FA bn, 155-mm, towed	6-425G	1,101.2	1	69	2		
			2		56		
			3		2	33	
4 HHB	6-426G	140.3	1	10	1		
			2		8		
			3		1	5	
5 3 FA btry (each)	6-427G	246.7	1	8			
			2		6		X
			3			4	
6 Svc btry	6-429G	238.4	1	14	1		
			2		13		
			3		1	7	
7 FA bn, 175-mm, SP	6-435G	1,334.7	1	59	3		X
			2		50		
			3		3	29	
8 HHB	6-436G	154.8	1	11	1		
			2		8		
			3		1	5	
9 3 FA btry (each)	6-437G	299.1	1	12	1		X
			2		10		
			3		1	6	
10 Svc btry	6-439G	258.1	1	14	1		X
			2		13		
			3		1	7	
11 FA bn, 8-in. SP	6-445G	1,390.3	1	58	6		X
			2		52		
			3		6	29	

Table 4–21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4–23)
	FA units—Continued							
12	HHB	6–416G	163. 0	1	11	1		
				2		9		
				3		1	5	
13	3 FA btry (each)	6–447G	320. 3	1	13	2		
				2		11		
				3		2	6	
14	Svc btry	6–449G	271. 3	1	13	1		X
				2		12		
				3		1	7	
15	FA bn, 155-mm, SP	6–455G	1,409. 2	1	55	4		X
				2		48		
				3		4	27	
16	HHB	6–456G	153. 0	1	9	2		
				2		8		
				3		2	5	
17	3 FA btry (each)	6–457G	334. 3	1	11	1		X
				2		10		
				3		1	6	
18	Svc btry	6–459G	250. 5	1	13	1		X
				2		12		
				3		1	7	
19	FA scty tm (FA)	6–500G		1	1			
				2		1	1	
				3			1	
20	FA scty tm (FB)	6–500G		1	1			
				2		1		
				3			1	
21	FA scty tm (FC)	6–500G		1	1			
				2		1		
				3			1	
22	HHB, corps arty	6–501G	260. 0	1	15	2		
				2		13		
				3		2	8	
23	FA bn, HJ	6–525G	881. 6	1	40	13		
				2		45		
				3		13	20	
24	HQ, H&S btry	6–526G	298. 3	1	18	2		
				2		15		
				3		2	9	
25	3 FA btry (each)	6–527G	194. 4	1	8	4		
				2		11		
				3		4	5	
26	FA bn, SGT	6–555G	943. 4	1	47	11		
				2		47		
				3		11	20	
27	HQ, H&S btry	6–556G	496. 0	1	23	7		
				2		25		
				3		7	11	
28	2 FA btry (each)	6–557G	223. 7	1	10	4		
				2		12		
				3		4	6	

Table 4-21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	FA units—Continued							
29	FA btry, slt	6-558G	174. 3	1	12			
				2		9		
				3			6	
30	FATAB	6-575G	1, 065. 9	1	59	8		
				2		54		
				3		8	29	
31	HHB	6-576G	345. 0	1	20	2		
				2		18		
				3		2	10	
32	3 FA btry (each)	6-577G	240. 3	1	13	2		
				2		13		
				3		2	8	
33	FA bn, PERSH	6-615G	2, 300. 0	1	115	24		X
				2		114		
				3		24	56	
34	HHB	6-616G	231. 3	1	15	1		
				2		13		
				3		1	8	
35	4 FA btry (each)	6-617G	310. 7	1	17	4		
				2		17		
				3		4	8	
36	Svc btry	6-619G	825. 9	1	40	8		X
				2		39		
				3		8	19	
	ADA units							
37	HHB, ADA bde	44-2G	125. 5	1	9			
				2		7		
				3			5	
38	ADA tgt det	44-8G	----------	1	1			
				2		1		
				3			1	
39	HHB, ADA gp	44-12G	110. 3	1	8			
				2		6		
				3			4	
40	ADA AW bn, SP	44-85G	1, 561. 8	1	58	32		X
				2		78		
				3		32	29	
41	HHB	44-86G	243. 8	1	14	1		X
				2		12		
				3		1	7	
42	4 ADA btry (each)	44-87G	329. 5	1	12	8		
				2		17		
				3		8	6	
43	ADA bn, HAWK (mbl)	44-235G	772. 3	1	39	9		
				2		39		
				3		9	19	
44	ADA bn, HERC	44-535G	1, 621. 4	1	100	3		
				2		81		
				3		3	49	

Table 4-21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	ADA units—Continued							
45	HHB	44-536G	785.4	1	47	3		
				2		40		
				3		3	22	
46	4 ADA btry (each)	44-537G	209.0	1	14			
				2		11		
				3			7	
	Avn units							
47	Avn co (airmbl)	1-77G	172.2	1	12	1		
				2		10		
				3		1	6	
48	Corps avn co	1-127G	247.9	1	12	5		
				2		13		
				3		5	12	
49	Avn Aerial survl co	1-128T	416.9	1	26	2		
				2		22		
				3		2	12	
50	AAVN co	1-137D	237.4	1	10	4		
				2		12		
				3		4	6	
51	Avn ATC co	1-207E	971.8	1	24	31		
				2		50		
				3		31	12	
	Cml units							
52	HHD, cml gp	3-32G	25.1	1	3			
				2		2		
				3			1	
53	HHD, cml smoke genr bn	3-266G	24.5	1	3			
				2		2		
				3			1	
54	Cml smoke genr co	3-267G	217.3	1	15			
				2		11		
				3			7	
	Engr units							
55	Engr cbt bn, army or corps	5-35G	2,164.2	1	70	39		
				2		93		
				3		39	34	
56	HHC	5-36G	617.9	1	23	7		
				2		24		
				3		7	11	
57	4 engr cbt co (each)	5-37G	486.6	1	19	8		
				2		23		
				3		8	9	
58	HHC, engr cbt gp	5-52E	142.0	1	10			
				2		8		
				3			5	
59	Engr aslt brg co	5-64T	343.3	1	12	8		X
				2		17		
				3		4	9	

Table 4-21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	Engr units—Continued							
60	Engr pnl brg co	5-77E	477.0	1	6	20		X
				2		24		
				3		20	3	
61	Engr fltbrg co	5-78G	614.0	1	31	3		X
				2		27		
				3		3	15	
62	Engr cam co	5-97E	52.0	1	5			
				2		4		
				3			3	
63	HHC, engr cbt bde, army	5-101E	63.0	1	6			
				2		5		
				3			3	
64	HHC, engr cbt bde, corps	5-101E	63.0	1	6			
				2		5		
				3			3	
65	Engr dptrk co	5-124G	602.0	1	7	28		
				2		31		
				3		28	4	
66	Engr topo bn, army	5-305G	603.4	1	28	6		
				2		30		
				3		6	14	
67	HHC	5-306G	321.0	1	13	3		
				2		13		
				3		3	7	
68	Engr map repro and distr co	5-307G	160.4	1	8	1		
				2		8		
				3		1	4	
69	Engr pmap co, army	5-308G	133.1	1	7	3		
				2		7		
				3		3	4	
70	Engr topo co, corps	5-327G	229.7	1	12	3		
				2		13		
				3		3	6	
71	HHC, engr amph bde	5-401E	113.0	1	12			
				2		9		
				3			6	
72	HHC, engr amph gp	5-402E	129.5	1	9			
				2		7		
				3			5	
73	Engr amph bn	5-405E	1,817.5	1	72	17		X
				2		72		
				3		17	35	
74	HHC	5-406E	928.8	1	51	4		X
				2		44		
				3		4	24	
75	2 engr amph aslt co (each)	5-407E	134.8	1	7	1		X
				2		6		
				3		1	5	
76	Engr amph co	5-408E	619.1	1	9	11		X
				2		19		
				3		11	5	

Table 4–21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C–130	6 C–124	7 C–141	8 Nonair-transportable items (see table 4–23)
	Engr units—Continued							
77	Engr topo planning and con tm (IG)	5–540G		1	1			
				2		1		
				3			1	
78	Engr geod surv tm (IE)	5–540G		1	1			
				2		1		
				3			1	
79	Engr mil hydrology tm (IL)	5–540G		1	1			
				2		1		
				3			1	
80	Engr map distr plat (ID)	5–540G	55. 9	1	4	1		
				2		4		
				3		1	3	
81	Engr terrain tm (IF)	5–540G		1	1			
				2		1		
				3			1	
	MI units							
82	MI bn, air recon spt, fld army	30–5G	387. 1	1	25			
				2		19		
				3			12	
83	HHC	30–6G	113. 9	1	9			
				2		5		
				3			4	
84	4 MID (each)	30–7G	68. 3	1	5			
				2		4		
				3			3	
85	MID, sep bde	30–14G	39. 6	1	3	1		
				2		3		
				3		1	2	
86	MID, armd cav regt	30–14G	39. 6	1	3	1		
				2		3		
				3		1	2	
87	MI CO, div	30–17G	82. 8	1	5	1		
				2		5		
				3		1	3	
88	MID, corps	30–18G	75. 7	1	6			
				2		5		
				3			3	
89	MI bn, fld army	30–25G	756. 0	1	51			
				2		40		
				3			26	
90	HHC	30–26G	185. 7	1	13			
				2		10		
				3			7	
91	MI co, intg	30–27G	49. 4	1	4			
				2		3		
				3			2	
92	MI co, ci	30–28G	165. 2	1	11			
				2		9		
				3			6	

Table 4-21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	MI units—Continued							
93	MI co, coll	30-29G	184.7	1	13			
				2		10		
				3			6	
94	MI co, TI	30-34G	171.0	1	12			
				2		10		
				3			7	
95	MI bn HQ (AD)	30-600G	36.7	1	3			
				2		3		
				3			2	
96	MI gp HQ (AE)	30-600G	31.0	1	3			
				2		3		
				3			2	
	Army Security Agency (ASA) units							
97	HHC, ASA gp, field army	32-52D	258.9	1	15	3		
				2		14		
				3		3	8	
98	HHC, ASA bn (corps)	32-56F	239.7	1	14	2		
				2		13		
				3		2	8	
99	ASA div spt co, (inf)	32-57F	244.9	1	17			
				2		14		
				3			9	
100	ASA op co	32-67E	426.6	1	26	2		
				2		22		
				3		2	13	
101	ASA proc co	32-77D	266.0	1	17	1		
				2		14		
				3		1	8	
102	ASA scty co	32-78D	212.5	1	13	2		
				2		12		
				3		2	7	
	Sig units							
103	Corps sig bn	11-15E	1,323.0	1	82	3		
				2		67		
				3		3	40	
104	HHC	11-16E	204.2	1	12			
				2		10		
				3			6	
105	Co co	11-17E	449.5	1	26			
				2		21		
				3			12	
106	Fld op co	11-18E	669.3	1	35	3		
				2		32		
				3		3	17	
107	Sig cbt area bn	11-85E	1,598.5	1	96	6		
				2		75		
				3		6	45	
108	HHC	11-86E	237.0	1	15	2		
				2		12		
				3		2	7	

Table 4-21. Combat Support Units—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	Sig units—Continued							
109	4 sig cbt area co (each)	11-87E	338.9	1	21	2		
				2		18		
				3		2	11	
110	Army sig bn	11-95D	2,424.4	1	141	8		
				2		119		
				3		8	68	
111	Sig op co, mdm HQ	11-127E	280.4	1	16	3		
				2		15		
				3		3	9	
112	Sig small HQ op co	11-147E	158.8	1	11			
				2		9		
				3			6	
113	Crypto spt tm, type B (NB)	11-500D		1	1			
				2		1		
				3			1	
114	Crypto spt tm, type C (NC)	11-500D	50.7	1	4			
				2		4		
				3			3	
115	Trans multiplex fac tm (RF)	11-500D	25.5	1	3			
				2		3		
				3			2	
116	Sig det, ADA sys comm (ADA gp) (RT)	11-500D	91.3	1	7			
				2		6		
				3			4	
117	ADPS cen (large) (TE)	11-500D	49.7	1	4			
				2		4		
				3			3	
118	ADPS cen (mdm) (TF)	11-500D	30.4	1	3			
				2		3		
				3			2	
119	ADPS cen (small) (TG)	11-500D		1	1			
				2		1		
				3			1	
120	Sig det, ADA sys comm (ADA bn) (RU)	11-500D		1	1			
				2		1		
				3			1	
	PSYOP units							
121	PSYOP tm (FB)	33-500G		1	1			
				2		1		
				3			1	
122	PSYOP tm (FE)	33-500G		1	1			
				2		1		
				3			1	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements

1	2	3	4	5	6	7	8
Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements C-130	C-124	C-141	Nonair-transportable items (see table 4-23)
Ammo units							
HHC, ammo DS/GS gp	9-22H	70.2	1	5	1		
			2		5		
			3		1		
HHC, ammo DS/GS bn	9-36G	211.2	1	12	3		
			2		12		
			3		3	6	
Ammo co, convl	9-38G	645.1	1	27	6		X
			2		27		
			3		9	14	
Sp ammo DS co	9-47H	1,182.6	1	60	7		
			2		58		
			3		10	32	
Sp ammo GS co	9-48G	727.3	1	38	13		
			2		43		
			3		8	20	
GM GS maint co	9-59G	742.3	1	35	12		
			2		38		
			3		10	18	
EOD det (KA)	9-500D		1	1			
			2		1		
			3			1	
Maint units							
Ord tire rep co	9-117G	349.5	1	17	4		
			2		16		
			3		4	9	
LE GS maint co, army	29-134G	570.7	1	27	7		X
			2		28		
			3		7	13	
HHD, maint DS or GS bn, army	29-136G	53.4	1	4			
			2		4		
			3			3	
Hv equip GS maint co, army	29-137F	652.0	1	27	4		X
			2		24		
			3		4	12	
Coll, clas, and salv co	29-139F	790.5	1	37	7		X
			2		36		
			3		7	18	
Lt maint DS co	29-207F	274.1	1	13	5		
			2		14		
			3		5	6	
Maint mgt det, FASCOM	29-403T	2.8	1	1			
			3		1		
			2			1	
Maint mgt det, spt bde	29-403T	3.8	1	1			
			2		1		
			3			1	
Trans acft DS co	55-457G	531.8	1	29	4		X
			2		25		
			3		2	14	
Trans acft maint GS co	55-458G	352.8	1	20	3		
			2		19		
			3		1	11	

Table 4–22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements C–130	Acft requirements C–124	Acft requirements C–141	Nonair-transportable items (see table 4–23)
		1	2	3	4	5	6	7	8
	Med units							
19	Med holding co	8–57E	36. 9	1	3			
				2		3		
				3			2	
20	HHD, med bde	8–112G	48. 6	1	4			
				2		3		
21	HHD, med gp	8–122G	30. 2	1	3			
				2		3		
				3			1	
22	Cbt spt hosp	8–123T	224. 4	1	15			
				2		12		
				3				
23	HHD, med bn	8–126G	47. 8	1	3	1		
				2		4		
				3		1	2	
24	Med amb co	8–127G	173. 5	1	12			
				2		10		
				3			6	
25	Med clr co	8–128G	108. 7	1	8			
				2		6		
				3			4	
26	Med coll co	8–129G	57. 5	1	6			
				2		4		
				3			3	
27	Med air amb co	8–137G	208. 4	1	13	2		
				2		12		
				3		2	7	
28	Med co, sep bde	8–147G	185. 4	1	14			
				2		10		
				3			6	
29	PVNTMED svc unit, fld	8–204E	116. 0	1	9			
				2		7		
				3			4	
30	Co HQ (AC)	8–500G	----------	1	1			
				2		1		
				3			1	
31	HQ, vet prof svc (AF)	8–500G	----------	1	1			
				2		1		
				3			1	
32	Prof svc det (AG)	8–500G	----------	1	1			
				2		1		
				3			1	
33	HQ, den prof svc (AI)	8–500G	----------	1	1			
				2		1		
				3			1	
34	Vet small animal hosp det (ID)	8–500G	----------	1	1			
				2		1		
				3			1	
35	Vet svc det, small (JA)	8–500G	----------	1	1			
				2		1		
				3			1	
36	Vet svc det, large (JB)	8–500G	49. 4	1	4			
				2		4		
				3			3	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	Med units—Continued							
37	Surgical det (KA)	8-500G	----------	1	1			
				2		1		
				3			1	
38	Ortho det (KB)	8-500G	----------	1	1			
				2		1		
				3			1	
39	Shock det (KC)	8-500G	----------	1	1			
				2		1		
				3			1	
40	Maxillofacial det (KD)	8-500G	----------	1	1			
				2		1		
				3			1	
41	Neurosurgical det (KE)	8-500G	----------	1	1			
				2		1		
				3			1	
42	Thoracic det (KF)	8-500G	----------	1	1			
				2		1		
				3			1	
43	Med trmt det, cml agts (KG)	8-500G	----------	1	1			
				2		1		
				3			1	
44	X-ray det (KH)	8-500G	----------	1	1			
				2		1		
				3			1	
45	Den op det (KI)	8-500G	----------	1	1			
				2		1		
				3			1	
46	Den svc det (KJ)	8-500G	34.6	1	3			
				2		3		
				3			2	
47	Den prosthetic det, mbl (KK)	8-500G	----------	1	1			
				2		1		
				3			1	
48	Med det, psychiatric (KO)	8-500G	----------	1	1			
				2		1		
				3			1	
49	Blood distr det (NC)	8-500G	----------	1	1			
				2		1		
				3			1	
50	Med det (OA)	8-500G	----------	1	1			
				2		1		
				3			1	
51	Med intel det (QA)	8-500G	----------	1	1			
				2		1		
				3			1	
52	Med det, hel amb (RA)	8-500G	40.7	1	4			
				2		3		
				3			2	
53	Med det, air crash rsq (RC)	8-500G	----------	1	1			
				2		1		
				3			1	

Table 4–22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C–130	6 C–124	7 C–141	8 Nonair-transportable items (see table 4–23)
	Med units—Continued							
54	Med det, air crash rsq (RD)	8–500G		1	1			
				2		1		
				3			1	
55	MASH	8–571E	138.9	1	9			
				2		8		
				3			5	
56	Evac hosp	8–581E	244.0	1	15	1		
				2		12		
				3		1	8	
57	Conv cen	8–590E	163.4	1	11			
				2		8		
				3			6	
58	Med lab	8–650E	118.1	1	9			
				2		7		
				3			4	
59	Army med dep	8–667E	260.9	1	17	1		
				2		14		
				3		1	9	
	MP units							
60	HHD, MP bn	19–76G	51.5	1	5			
				2		3		
				3			2	
61	MP ESCRG co	19–47G	45.0	1	4			
				2		3		
				3			2	
62	MP co	19–77G	211.1	1	10	4		
				2		13		
				3		4	5	
63	MP phys scty co	19–97G	105.0	1	8			
				2		6		
				3			4	
64	MP gd co	19–247E	29.5	1	3			
				2		2		
				3			2	
65	HHD, MP bde	19–262G	58.7	1	4	1		
				2		4		
				3		1	3	
66	HHD, MP bn (AD)	19–500E	20.8	1	2			
				2		2		
				3			1	
67	MP det, hosp scty (2FD) (each)	19–500E	4.2	1	1			
				2		1		
				3			1	
68	MP det, hosp scty (7IC) (each)	19–500E	5.2	1	1			
				2		1		
				3			1	
69	MP det, hosp scty (IG)	19–500E	4.2	1	1			
				2		1		
				3			1	
70	MP det, crim inves (LA)	19–500E	14.1	1	1			
				2		1		
				3			1	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	MP units—Continued							
71	MP det, crim inves (LC)	19-500E	21.1	1	2			
				2		3		
				3			2	
72	MP det (MC)	19-500E	19.4	1	2			
				2		2		
				3			1	
	S&S units							
73	Fftg tm (FA)	5-510G	5.1	1	1			
				2		1		
				3			1	
74	Fftg tm (FB)	5-510G	11.7	1	1			
				2		1		
				3			1	
75	Fftg tm (FC)	5-510G		1	1			
				2		1		
				3			1	
76	Fftg tm (3FD) (each)	5-510G	11.2	1	1			
				2			1	
				3			1	
77	Gas genr tm (GF)	5-520G	103.9	1	6	2		
				2		6		
				3		2	4	
78	CO_2 genr tm (GG)	5-520G		1	1			
				2		1		
				3			1	
79	Util tm (HC)	5-530G	68.6	1	4	2		
				2		5		
				3		2	3	
80	Util tm (HD)	5-530G	84.4	1	4	2		
				2		5		
				3		2	3	
81	Util tm (HH)	5-530G		1	1			
				2		1		
				3			1	
82	QM air dlvr co	10-407H	454.2	1	22	7		
				2		23		
				3		3	13	
83	Sales det, mbl (7BA) (each)	10-500G		1	1			
				2		1		
				3			1	
84	Sales det, mbl (BB)	10-500G		1	1			
				2		1		
				3			1	
85	Sales det, mbl (BC)	10-500G		1	1			
				2		1		
				3			1	
86	Fld svc GS co, fwd	29-114H	514.4	1	33	1		
				2		26		
				3		1	16	
87	Gen sup GS co	29-118H	425.0	1	24	3		X
				2		22		
				3		3	12	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	2	3	4	5	6	7	8
1 Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements C-130	C-124	C-141	Nonair-transportable items (see table 4-23)
MP units—Continued							
88 Rep parts GS co, fwd, corps	29-119H	414.8	1	17	4		
			2		17		
			3		4	9	
89 Rep parts GS co, army	29-119H	601.2	1	24	6		
			2		23		
			3		3	13	
90 Fld svc GS co, army	29-124H	298.9	1	19	2		
			2		16		
			3		2	9	
91 Hv mat sup GS co	29-127H	403.3	1	14	8		X
			2		18		
			3		6	8	
92 HHC, spt svc bn	29-146G	112.5	1	8	2		
			2		6		
			3		2	4	
93 Invt con co, FASCOM	29-402T	230.8	1	14	1		X
			2		12		
			3		1	8	
94 HHC, avn bn	1-256G	64.5	1	5			
			2		4		
			3			3	
95 Avn mdm hel co	1-258G	187.2	1	10	2		
			2		10		
			3		2	6	
96 Avn hv hel co	1-259G	151.7	1	8	2		
			2		8		
			3		2	4	
97 HHD, trans MCC	55-6F	118.8	1	9			
			2		6		
			3			5	
98 HHD, TMT bn	55-16G	28.2	1	3			
			2		3		
			3			2	
99 Trans lt trk co (2½-ton)	55-17G	581.7	1	36	1		
			2		31		
			3		2	15	
100 Trans lt trk co (5-ton)	55-17G	810.9	1	50	1		
			2		42		
			3		1	25	
101 Trans mdm trk co (cgo)	55-18G	1,088.1	1	42	22		
			2		56		
			3		22	21	
102 Trans mdm trk co (petrl)	55-18G	1,103.4	1	42	22		
			2		57		
			3		22	21	
103 Trans cgo, army	55-19E	207.7	1	14	1		
			2		10		
			3		1	7	
104 Trans hv trk co	55-28G	1,249.2	1	10	1		X
			2		8		
			3		1	6	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	MP units—Continued							
105	Trans tac carr co	55-47T	790.0	1	13	23		X
				2		38		
				3		23	7	
106	HHC, trans bde	55-62F	64.4	1	6			
				2		4		
				3			3	
107	Trans lt-mdm trk co	55-67G	825.6	1	43	8		
				2		42		
				3		8	21	
108	Trans tml trf co	55-118G	618.7	1	32	7		
				2		32		
				3		7	16	
	Pers svc units							
109	SPS det (8AB, 30FA)	12-18G	27.1	1	2			
				2		2		
				3			1	
110	HHD, P&A bn, fld army	12-66G	33.2	1	3			X
				2		2		
				3			1	
111	Per svc co (type F)	12-67H	46.9	1	3			
				2		3		
				3			2	
112	Army band	12-107G	6.2	1	1			
				2		1		
				3			1	
113	APU (18AB, 18FG, 18HC, 18JA)	12-550G	307.1	1	21			
				2		18		
				3			9	
114	Repl req det (each corps and FASCOM: AB, 2CA, 4FA, GB).	12-560G	123.9	1	9			
				2		7		
				3			5	
115	Admin svc det (type A)	12-570G	99.1	1	7			
				2		6		
				3			3	
116	Fin DS co	14-17G	35.2	1	3			
				2		2		
				3			1	
117	DPU (type B)	29-550T		1	13			
				2		11		
				3			6	
	Misc units							
	CA:							
118	HHD, CA bn (AD)	41-500G	31.2	1	2			
				2		2		
				3			1	
119	CA civ info tm (HB)	41-500G	4.5	1	1			
				2		1		
				3			1	
120	CA civ sup tm (IC)	41-500G	22.4	1	2			
				2		2		
				3			1	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	1 Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combination	5 Acft requirements C-130	6 C-124	7 C-141	8 Nonair-transportable items (see table 4-23)
	Misc units—Continued							
121	CA DP, refugee, and evacuee tm (JC)	41-500G	6.1	1	1			
				2		1		
				3			1	
122	CA labor tm (MB)	41-500G	4.4	1	1			
				2		1		
				3			1	
123	CA pub comm tm (PB)	41-500G	4.5	1	1			
				2		1		
				3			1	
124	CA pub health tm (SB)	41-500G	5.9	1	1			
				2		1		
				3			1	
125	CA pub safety tm (TB)	41-500G	4.5	1	1			
				2		1		
				3			1	
126	CA pub trans tm (UB)	41-500G	4.5	1	1			
				2		1		
				3			1	
127	CA pub wlf tm (VB)	41-500G	4.4	1	1			
				2		1		
				3			1	
128	CA pub works and util tm (WB)	41-500G	4.5	1	1			
				2		1		
				3			1	
129	CA lang tm (ZC)	41-500G	6.2	1	1			
				2		1		
				3			1	
130	HHD, CA co (AC)	41-500G	24.8	1	2			
				2		2		
				3			1	
131	CA plat HQ tm (4AB) (each)	41-500G	6.4	1	1			
				2		1		
				3			1	
132	CA civ sup tm (IA)	41-500G	8.5	1	1			
				2		1		
				3			1	
133	CA DP, refugee, and evacuee tm (4JA) (each).	41-500G	4.3	1	1			
				2		1		
				3			1	
134	CA labor tm (4MA) (each)	41-500G	4.3	1	1			
				2		1		
				3			1	
135	CA pub health tm (4SA) (each)	41-500G	4.5	1	1			
				2		1		
				3			1	
136	CA pub safety tm (4TA) (each)	41-500G	4.3	1	1			
				2		1		
				3			1	
137	CA lang tm (4ZA) (each)	41-550G	4.5	1	1			
				2		1		
				3			1	

Table 4-22. Combat Service Support Units (Field Army Support Command)—Aircraft Requirements—Continued

1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements C-130	C-124	C-141	Nonair-transportable items (see table 4-23)
	Misc units—Continued							
138	CA mess tm (CA)	29-500G	8.8	1	1			
				2		1		
				3			1	
	Judge advocate general (JAG):							
139	JAG det (3AA) (each)	27-500G	0.6	1	1			
				2		1		
				3			1	
140	JAG det (AB)	27-500G	6.0	1	1			
				2		1		
				3			1	
141	JAG det (6FA) (each)	27-500G	5.4	1	1			
				2		1		
				3			1	
142	JAG det (FB)	27-500G	7.4	1	1			
				2		1		
				3			1	
143	JAG det (3GA) (each)	27-500G		1	1			
				2		1		
				3			1	
144	JAG det (GB)	27-500G		1	1			
				2		1		
				3			1	
145	JAG det (4HA) (each)	27-500G		1	1			
				2		1		
				3			1	
146	JAG det (2HB) (each)	27-500G		1	1			
				2		1		
				3			1	
147	JAG det (6IA) (each)	27-500G		1	1			
				2		1		
				3			1	
148	JAG det (IB)	27-500G		1	1			
				2		1		
				3			1	
	Hist:							
149	Mil hist det	20-17G	1.8	1	1			
				2		1		
				3			1	
	Pub info:							
150	Pub info tm (AE)	45-500G		1	1			
				2		1		
				3			1	
151	Pub info tm (FA)	45-500G	6.0	1	1			
				2		1		
				3			1	

Table 4-23. TOE Items Not Air Transportable

a. Items Too Heavy for C-130, C-124, or C-141 Aircraft

1	1	2	3	4	5	6
	Line item number	Item	Weight (STON)	Dimensions (ft)		
				Length	Width	Height
2	E56577	CEV, full-tracked (T118E1)	53. 0	26. 0	12. 2	10. 9
3	L43664	Lchr, M60-series tk chassis, trans 40- and 60-ft brg, type cl 60	41. 5	39. 0	12. 0	7. 9
4	R50680	Recov veh, full-tracked, mdm (M88)	54. 0	27. 2	11. 5	9. 9
5	V12826	Tk, cbt, full-tracked, 76-mm gun (M41Aa)	43. 1	30. 7	10. 7	9. 5
6	V13100	Tk, cbt, full-tracked, 105-mm gun (M60)	48. 5	26. 7	11. 9	10. 3

b. Items Too Large for C-130, C-124, or C-141 Aircraft

1	1	2	3	4	5	6
	Line item number	Item	Weight (STON)	Dimensions (ft)		
				Length	Width	Height
2	C20414	Brg, armd—veh-launched, scissor-type, cl 60, aluminum, 60-ft long	15. 4	36. 3	13. 2	13. 3
3	C22469	Brg, ferry unit, end bay, amph, mbl, fltg, aslt	9. 7	37. 0	12. 0	11. 7
4	C22606	Brg, ferry unit, interior bay, amph, mbl, fltg, aslt	7. 2	26. 0	12. 0	10. 5
5	C25620	Brg, fltg, mbl, aslt, amph	26. 6	36. 1	10. 0	10. 3
6	F39241	Crane, wheel-mtd, 5-ton ⅜-cu yd, diesel, 4×4, rough terrain	14. 5	23. 1	10. 0	11. 0
7	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	30. 5	28. 5	11. 5	12. 3
8	J30766	Genr and chg plant, acetylene, stlr-mtd, 750 cfh	15. 6	33. 4	8. 4	11. 4
9	J97230	Gun, FA, SP, 175-mm (M107)	26. 4	37. 2	10. 5	9. 3
10	K56981	How, hv, SP, 8-in (M110)	26. 8	22. 1	10. 5	9. 3
11	K57666	How, mdm, SP, 155-mm (M109)	24. 7	20. 0	10. 8	9. 2
12	K57255	How, lt, SP, 105-mm (M108)	22. 7	20. 1	10. 8	9. 2
13	R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg	27. 1	39. 3	10. 0	11. 7
14	R50543	Recov veh, full-tracked, lt armd (M578)	23. 8	21. 8	10. 5	9. 7
15	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip	16. 8	36. 8	12. 0	6. 8
16	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	21. 2	38. 5	12. 2	8. 8
17	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip	7. 5	26. 9	8. 2	11. 2
18	W76816	Trac, full-tracked, low-spd, diesel, hv DBP, with bulldozer, with scarifier winch.	22. 0			
19	X59600	Trk, trac, 10-ton, 6×6, with dual midship winch, with high-mtd 5th wheel, with equip.	14. 5	24. 1	9. 5	9. 3

4-13. Movement by Water

a. General. Chapter 7 contains capacities of ships and craft, sea distances, steaming rates, turnaround times, and factors for cargo shipping.

b. Assault Landings Over Beaches.

(1) *Beach analysis and selection.* Strategic considerations aside, the basis for selection of a beach for an assault landing is the potential of the beach and hinterland to permit the initial landing and the followup logistic support of the forces required for the operation. From a logistic standpoint the most important considerations are the characteristics of the beach, beach exits, and hinterland and the forecast weather conditions as they influence the ability of the combat service support forces to support and maintain the forces ashore. Increased use of helicopters and amphibious vehicles makes possible the use of less desirable beach areas in the initial assault. Under new concepts of operation and with the employment of nuclear weapons, dispersal of forces and supplies will be necessary; therefore, emphasis will be on the analysis and selection of many small beaches, adequately linked by lines of communications, rather than a few long ones as in the past.

(2) *Considerations in selection.* Planners should make a detailed investigation and thorough study of the hydrography and topography

of the landing area, as well as of the long-range forecasts of the weather that may be encountered. Primary considerations in selecting beaches for assault landings are discussed below (fig. 4–8 depicts certain of the features discussed).

(*a*) *Tides.* The stages of the tide, the tidal range, and the tidal currents affect the passage of underwater obstacles, offshore bars, reefs or shoals, the beaching or stranding of landing craft, and the width of the beach available for operations.

(*b*) *Surf.*

1. Waves breaking onto a beach (surf) may cause landing craft to broach to, thus necessitating a study of surf in connection with landing operations. Surf action depends on wind, tide, and depth of water. On flat, nearshore bottoms, waves break and are spent before reaching the shoreline. Over steep slopes, the surf breaks near the shore and consequently has more effect on the beaching of craft. Waves usually break over reefs, where they exist, thus leaving the inner area relatively unaffected. Forecasters can predict surf conditions hours, and in some cases days, in advance for almost all shores of ocean areas for which they receive regular weather reports. Waves created by distant storms may break on a shore with a high or heavy surf, even while local weather conditions are otherwise ideal. Surf forecasts should cover the entire operation and should be available for use as long as any operations across the unprotected beaches are necessary.

2. The height of the surf markedly affects the satisfactory operation of amphibious vehicles and landing craft. LARC–5's experience a 50-percent reduction in effectiveness when the height of the surf reaches 3 feet; LARC–15's when the height is 4 feet; and LARC–60's when the height reaches 6 feet. Except during emergencies, operation is usually suspended when the surf exceeds 5 feet for LARC–5's, 6 feet for LARC–15's, and 8 feet for LARC–60's. LCVP are effective when the surf is not more than 3 feet; LCM can operate satisfactorily in a surf of not more than 5 feet; and LVTP–5 are effective through surf up to 8 feet high.

(*c*) *Nearshore bottom gradient.* Gently sloping bottom gradients cause landing craft to ground at a considerable distance from the shoreline, which increases the hazard and time of unloading. Beaches with steep gradients are subject to heavy surf. Because a steep gradient usually extends shoreward from the waterline, planners can anticipate difficulty in moving vehicles and cargo off the beach. A beach gradient of 1 to 20 (1 foot increase in water depth each 20 feet seaward from the waterline) is nearly ideal for the operation of landing craft and amphibious vehicles.

(*d*) *Reefs.* In many places reefs or shoals fringe the shorelines and must be studied before conducting beaching operations. A minimum 6-foot depth of water should be available over reefs or shoals at low tide to permit the low-water operation of landing craft. This is not the normal situation because most reefs are either very close to the surface or entirely exposed at low tide, in which case certain craft must operate at high tide only. A minimum 11-foot depth of water at low tide is required for the operation of LST's. When selecting beach sites planners should avoid reefs or shoals that limit operations.

(*e*) *Weather.* Planners must consider predicted weather conditions in relation to the projected operation. Adverse weather conditions and their effects on tide and surf may make the operations too hazardous or impossible. Haze or fog conditions may be advantageous or disadvantageous, depending on overall considerations of the operation in question. The weather considerations should cover the entire operation and should insure favorable conditions for not only the assault landings but also the followup and buildup phases.

(*f*) *Topographic.* Having effected a lodgment ashore, the landing forces will expand the beachhead and general movement inland. Topographic features are of immediate importance. Considerations are the overall length of beach; the extent of access to the interior from the beach (number of corridors and utility of each, the existing road net and means of reaching it from the beach); and areas suitable for supply dumps (both in the beach area and inland), airstrips, airdrops, helicopter landing sites, and cover and concealment. Planners must analyze each of these factors with respect to the advantages or disadvantages that a particular site may offer.

(*g*) *Equipment.* Planners determine requirements for equipment to unload supplies over the beach. If available equipment will not be adequate, they must make an early effort toward procurement of sufficient amounts of the proper types.

GENERAL BEACH PROFILE DIAGRAM

(TIDAL SEA)

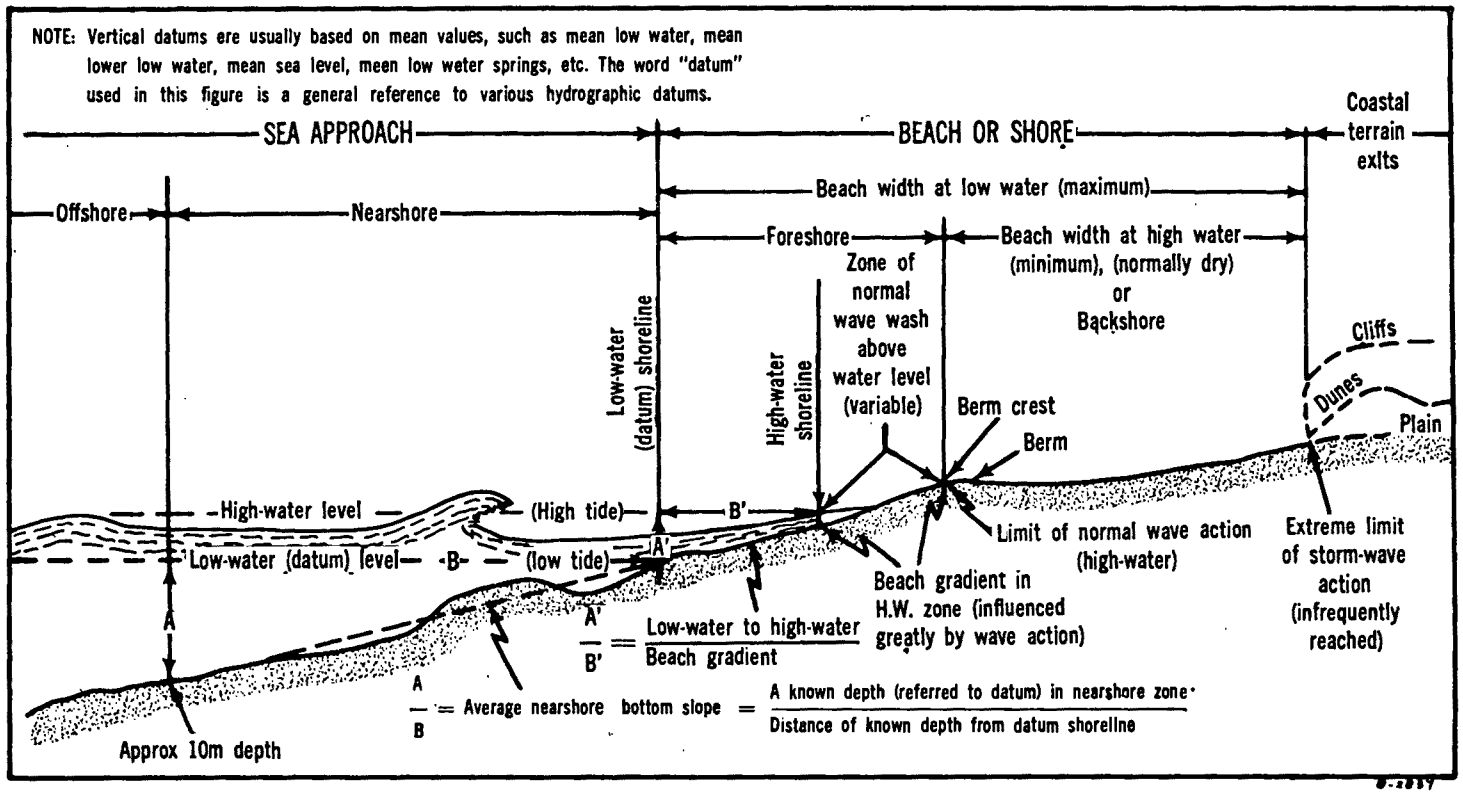


Figure 4–8. General beach profile diagram.

(*h*) *Enemy action.* Enemy action may be active or passive. Active enemy action includes the use of existing defense installations, established fields of fire, and defending forces. Enemy air and naval capabilities also are considerations. Passive enemy action includes obstacles, demolitions, and mines in water adjacent to the beach, on the beach, and immediately inland. All these will affect the ability of the combat service support troops to furnish the necessary logistic support.

(*i*) *Troop availability.* Planners must analyze troops available for the operation, to include extent of training, experience, and general suitability of combat, combat support, and combat service support elements for the operation.

(*j*) *Time.* After analyzing the factors in (*a*) through (*i*) above, planners can decide the time and place to launch an operation. In addition, visibility (because it affects surprise and operations) in the relative number of hours of darkness, moonlight, and daylight influences the exact time (week, day, and hour) for the assault. The relative effectiveness of the fire and support of the assaulting and defending forces will determine whether the landing takes place in darkness or daylight.

(3) *Beach capacity for assault landing.*

(*a*) *Size of beaches.* The number of troops that can land simultaneously in assault over a given beach results from a combination of factors. The tactical formation employed by the assault troops should be the dominant factor, provided safety precautions and good judgment are not sacrificed. In general, the length of beach required for landing an infantry brigade varies with its task organization.

(*b*) *Time and space factors for landing craft and amphibious vehicles.* The interval between landing craft or amphibious vehicles landed simultaneously on a beach varies from 45 to 90 meters, or an average of 68 meters. The time interval between waves varies from 1 to 15 minutes.

(*c*) *Average landing times.* The combat elements of a battalion landing team (BLT) require 2 hours to land over one landing beach employing 17 landing vehicles, tracked, howitzer (LVTH); and 15 landing vehicles, tracked, personnel (LVTP).

(*d*) *Assault shipping requirements.* When employed in the assault, the reinforced infantry division task organization will typically provide assault battalion landing teams, a division artillery grouping, a division reserve grouping, a division shore party grouping, and a division combat service support grouping. The reinforced armored division may also be an assault division. Assault shipping required for a reinforced infantry division will vary according to the tactical mission and length of voyage. (The number of landing ships varies in proportion to the number of amphibious vehicles, ground combat vehicles, LCU's, and LCM's to be carried.)

1. For long voyages (e.g., 10 days) planners primarily must consider provision of the type of shipping that will negotiate the distance at a suitable speed and that will best accommodate the embarked troops. APA's and AKA's meet these requirements better than landing ships. Assault shipping for a reinforced infantry division for an extended voyage, therefore, conforms to the general pattern that table 4–24 depicts.

Table 4–24. Assault Shipping Requirements—Long Voyages

1	1 Type of ship	2 Personnel	3 Vehicles	4 Number of ships	5 Total personnel	6 Total vehicles
2	APA	1,500	50	6	9,000	300
3	AKA	200	150	15	3,000	2,250
4	LST	190	30	26	4,940	780
5	LSD	300	100	7	2,100	700
6	LPH	1,500	0	4	6,000	0
7	Total				25,040	4,030

2. For short voyages (e.g., 48–72 hours) accommodation of embarked troops can be subordinated to provision of the most suitable shipping for ease and efficiency in loading and unloading. Landing ships meet these requirements better than APA's and AKSA's, especially when ground combat vehicles and amphibious vehicles are a consideration. Assault shipping for a reinforced infantry division for a short voyage, therefore, conforms to the pattern that table 4–25 depicts.

3. The APA carry large numbers of personnel but few vehicles. A large vehicle requirement or an increased use of LVT's and helicopters in the ship-to-shore movement will generally increase the use of AKA-, LST-, LSD-, and LPH-

Table 4-25. Assault Shipping Requirements—Short Voyages

1	1 Type of ship	2 Personnel	3 Vehicles	4 Number of ships	5 Total personnel	6 Total vehicles
2	APA	1,500	50	3	4,500	150
3	AKA	200	150	6	1,200	900
4	LST	190	30	45	8,550	1,350
5	LSD	300	100	16	4,800	1,600
6	LPH	1,500	0	4	6,000	0
7	Total				25,050	4,000

type ships in the amphibious assault, with a resultant decrease in the number of APA-type ships.

4. Available shipping always affects the composition of assault shipping. Efficient loading and allowable overloads likewise affect the number of personnel and vehicles that can be loaded. For example, it was common in both Europe and the Pacific in World War II to load 500 troops on LST's.

(*e*) *Vehicles and supply.* In loading assault craft, vehicles or supplies may be substituted for men on the basis of space or weight, whichever is the determining factor in each case. The boat space occupied by one man and his individual equipment normally is 240 pounds, 13.5 cubic feet, or 3 square feet.

(4) *Logistics.* The logistic plan for an amphibious operation must complement and implement the scheme of maneuver ashore.

c. River Crossing.

(1) *Bridges.* In an assault on a river line, the number of bridges provided for each tactical unit will vary, depending on such factors as width of river, stream velocity, available road net, trafficability of the soil, types and amounts of equipment available, and number of available engineer troops. As a rule, at least two floating bridges to take division loads will be necessary in the zone of each assault division. Normally, one additional bridge per corps zone and at least one in the field army zone will supplement these bridges. TASCOM troops ordinarily will provide a railroad bridge in the zone of each field army.

(2) *Ferries.* Besides the foregoing factors, the number of bridges planned and the extent of landing craft and amphibious vehicles employed will affect the numbers and types of ferries to use. For narrow streams the construction of a bridge at each available site is frequently more economical than using ferries. On the other hand, in crossing a wide river when the construction of bridges will be delayed, troops will use ferries of all types to the greatest extent.

(3) *Detailed characteristics of assault boats, bridging, and ferry equipment.* See paragraphs 4-28 and 4-29.

Section III. TRAINING AREAS AND FACILITIES

4-14. Maneuver Area

a. Current doctrine on the employment of divisions in both nuclear and nonnuclear warfare increases the requirements for training areas in size and for variety in types of terrain, cover, and concealment. The increased versatility and range of infantry, armor, and artillery weapons; the increased use of aircraft for the mobility of divisional units; and the requirements for greater dispersion of units in a tactical area have outmoded previous concepts of both field exercise areas and firing and impact areas. Consequently, installations that have previously been used for the training of divisions are no longer capable of meeting present-day requirements.

b. The information in (1) through (3) below is pertinent to the data included in table 4-26, which lists the average training area requirements for various types of units.

(1) Division strengths include nondivisional and supporting troops, i.e., aggregate strength. Corps strength includes corps troops plus one-third of normal field army engineer and field army air defense artillery (ADA) units.

(2) In connection with the firing and impact area for the airborne division, cleared areas for drop and assault transport landing zones are a consideration. An airfield capable of taking large transports should be nearby. An airborne division maneuver area should contain an airfield capable of handling large airplanes immediately adjacent to the cantonment area. One or more large drop and assault transport landing zones should be near the cantonment area, and the others scattered throughout the maneuver area. At least one such zone

Table 4–26. Data on Installation Areas in Approximate Acreages

1	1 Typical units	2 Approximate number of troops	3 Cantonment area (acres)	4 Miscellaneous activities area (acres)	5 Field exercise area (acres)	6 Firing and impact area (acres)	7 Total (acres)
2	Inf div	30, 000	2, 200	1, 000	50, 000	140, 000	193, 200
3	Inf div (mech)	30, 000	2, 200	1, 000	70, 000	140, 000	213, 200
4	Armd div	30, 000	2, 200	1, 000	70, 000	140, 000	213, 200
5	Abn div	30, 000	2, 200	1, 000	50, 000	90, 000	143, 200
6	Corps trps	30, 000	2, 400	1, 000	10, 000	40, 000	53, 400
7	ADA firing cen	2, 500	250	150	6, 000	70, 000	76, 400
8	Tk firing cen	2, 500	250	150	Not required	140, 000	140, 400

should be adjacent to the firing and impact area to permit conduct of small-unit problems using live ammunition.

(3) ADA firing center troops, cantonment, and miscellaneous activities support three automatic weapon battalions. These three battalions require position areas and danger areas for simultaneous firing through 45° safety angle. However, the danger area may be sited over water. For range safety requirements, see AR 385–62 for missiles and AR 385–63 for guns.

(4) Tank firing center troops, cantonment, and miscellaneous activities support three tank battalions and proportionate station overhead.

c. A maneuver area of approximately 4 million acres is required for a corps field training exercise involving three divisions and a normal corps slice of combat, combat support, and combat service support units. An impact area of 15,000 acres should be available in or adjacent to the maneuver area to accommodate live-firing exercises.

4–15. Training Facilities for Airborne, Infantry, (Mechanized), Airborne, and Armored Divisions

a. The division cantonment area should be near the perimeter of the land available and accessible to highways and railroad facilities. The area should provide all housing, storage, railroad yards, administration, shops, close-in training areas, miscellaneous training courses, and recreational facilities. For a functional layout of division camps, see OCE drawing numbers E–16–06–21 and E–16–06–22, obtainable from Office, Chief of Engineers. See also appropriate AR 210-series.

b. The miscellaneous activities area includes the station hospital, airfields, division review field, and other administrative activities not included in the cantonment area.

c. The field exercise area includes all available land except that used for cantonment, miscellaneous activities, and firing impact area. Portions of the firing impact area not in use during the exercises may serve as a field exercise area. This area should contain streams or lakes for training in construction of fixed and floating bridges. Landing strips for organic aircraft should be at several places in the field exercise area. The area for an airborne division should contain several cleared areas suitable for use as drop and landing zones.

d. The firing and impact area permits firing all ranges simultaneously. For suggested layout, see AR 210–21. For safety requirements, see AR 385–63. This area should be of varied terrain with suitable locations for ground observation points. The impact area may be submarginal or swamp land.

e. The division review field should be an area at least 220 by 1,400 meters adjacent to or near the cantonment area.

f. A landing field should be available near the cantonment area for use by organic aircraft.

g. There should be four airfields capable of meeting minimum airfield standards for operations under favorable weather conditions and handling current and planned assault transport aircraft.

h. There should be airfields suitable for use by Air Force aircraft within 1 day's march of an airborne division installation.

i. Range requirements for the infantry, airborne, and armored divisions are in AR 210–21, together with the number of positions, lanes, bays, or firing points required for each type of unit. This AR also contains appropriate drawing number and FM references.

4–16. Umpire Requirements

For umpire requirements, see FM 105–5.

Section IV. TACTICAL OPERATIONS

4-17. Characteristics of Weapons

a. This paragraph provides the characteristics of weapons in the following categories:

(1) Vehicular weapons, combat vehicles (less artillery) (table 4-27).

(2) Infantry weapons (table 4-28).

(3) Field artillery cannons and rockets (table 4-29).

(4) Field artillery missiles (table 4-30).

(5) Field artillery final protective fires (table 4-31).

(6) Field artillery targets (table 4-32).

b. Definitions pertaining to characteristics of weapons are as follows:

(1) *Maximum range*—The greatest distance a weapon will fire. It is estimated at 45° elevation for vehicular weapons.

(2) *Maximum rate of fire*—The greatest rate at which a well-trained gunner can fire.

(3) *Sustained rate of fire*—The rate at which a weapon can fire indefinitely without seriously overheating.

(4) *Maximum effective rate of fire*—The rate at which a trained gunner can fire and obtain a reasonable number of hits (50 percent).

(5) *Maximum effective range*—The greatest distance at which a gunner can be expected to fire accurately.

(6) *Maximum rate of fire in rounds per minute*—The rate based on a 3-minute period for all weapons other than those indicated (table 4-29).

(7) *Time to emplace in minutes*—The time needed to enter a minimally prepared position and report "laid and ready to fire."

(8) *Field artillery final protective fire*—A special type of prearranged fire placed on a final protective line. Data in tables 4-31 and 4-32 are approximate and will vary for different charges and terrain.

(9) *Effectively covered area*—That area in which there is at least a 50-percent chance that a man standing will become a casualty. The area is roughly elliptical.

c. Characteristics of ADA and some details of field artillery rockets and missiles are contained in FM 44-1A, FM 44-96A, and FM 101-10-3.

d. Nuclear effects data are contained in FM 101-31-2.

4-18. Characteristics of Chemical Agents and Munitions

This paragraph provides data on characteristics of chemical agents (table 4-33), and munitions (table 4-34).

Table 4-27. Vehicular Weapons, Combat Vehicles (Less Artillery)

1	2	3	4	5	6	7	8
Line item number	Vehicle	Primary weapon	Rate of fire (rd per min)	Maximum range (m)	Effective range (m)		Approx bursting area (m)
					Armor defeating	Other targets	
H68200	APC, M113	Flamethrower, mech, main armt, APC-mtd, M10-8.	6.2 gal per sec.	183.			
J96819	Gun, 40-mm, SP, M42A1	Gun, 40-mm, M2A1.	240	HE-T Vert—4,650. Horiz—4,775.		1,650 (aerial tgts).	
J96956	Gun, 90-mm, SP, full-tracked, M56.	Gun, 90-mm	NA	19,870	2,000—AP-T	4,600—HE 4,600—smoke.	37 by 6 (HE).
M68076	Mort, 81-mm, SP	Mort, 81-mm	Normal—18 Max—30	HE—3,100 (approx). Illuminating—2,300. Smoke—2,450 (approx).			25 by 20 (A).
M68145	Mort, 107-mm, SP, full-tracked.	Mort, 107-mm	Normal—5 Max—20	HE—4,925 Cml—4,625. Illuminating—4,725.			40 by 15 (A).
V12826	Tk, cbt, full-tracked, 76-mm gun.	Gun, 76-mm	NA	14,388	2,000—AP-5 2,000—HEAT	4,600—HE 4,600—smoke. 185—canister.	30 by 5 (HE).
V12963	Tk, cbt, full-tracked, 90-mm gun.	Gun, 90-mm	NA	19,870	2,000—AP-T 2,000—HEAT	4,400—HE 4,400—smoke. 185—canister.	37 by 6 (HE).
V13100	Tk, cbt, full-tracked, 105-mm gun.	Gun, 105-mm	NA	9,500—HEP-T at 37° elev.	2,000—HEAT 2,000—APDS-T.	4,400—HEAT	40 by 8 (HEP-T).
V13237	Tk, cbt, full-tracked, 120-mm gun.	Gun, 120-mm	NA	17,700—HE. 23,130—AP-T.			
Z32321	GM sys, AD, Chaparral (XM48).	Msl	NA	Classified	Classified	Classified	Classified.
	Shillelagh msl sys, XMGM-57A.	Msl	Classified	Classified	Classified	Classified	Classified.
	TOW msl sys	Msl	Classified	Classified	Classified	Classified	Classified.

Table 4-28. Infantry Weapons

1	1 Line item number	2 Weapon	3 Cyclic (C) or maximum (M) rate of fire (rd per min)	4 Sustained rate of fire (rd per min)	5 Maximum effective rate of fire (rd per min)	6 Maximum range (m)	7 Maximum effective range (m)	8 Approx effective bursting area (m)
2	G22046	Disperser, riot con agt, M106, CS-1.	Continuous discharge 15 sec.	Continuous discharge 15 sec.	Continuous discharge 15 sec.	----------	----------	NA.
3	G22109	Disperser, riot con agt, hel- or veh-mtd, M5.	Continuous discharge 120 sec.	Continuous discharge 120 sec.	Continuous discharge 120 sec.	12 (in still air with gun).	12 (in still air with gun).	NA.
4	G22246	Disperser, riot con agt, ptbl, M3.	Continuous discharge 19 sec.	Continuous discharge 19 sec.	Continuous discharge 19 sec.	12 (in still air)	14 (in still air)	NA.
5	H68063	Flamethrower, ptbl, M2A1-7	Continuous discharge 8 sec.	Continuous discharge 8 sec.	Continuous discharge 8 sec.	Unthickened fuel—25. Thickened fuel—50.	Unthickened fuel—25. Thickened fuel—50.	NA.
6	H68063	Flamethrower, ptbl, ABC, M9-7.	Continuous discharge 8 sec.	Continuous discharge 8 sec.	Continuous discharge 8 sec.	Unthickened fuel—25. Thickened fuel—50.	Unthickened fuel—25. Thickened fuel—50.	NA.
7	J95349	GM, at, with HEAT, 130-mm whd (Entac).	2-3	2-3	----------	2,000	2,000	NA.
8	J95359	GM, at, with HEAT, 140-mm whd (M22B).	----------	----------	----------	Classified	Classified	NA.
9	L44575	Lchr, gren, 40-mm, M79	----------	----------	----------	400	Pt tgts—150. Area tgts—350.	6.
10	L45260	Lchr, rkt, 3.5-in, M20A1	18	4	----------	825	Armor defeating 185—moving; 275—stationary. Other tgts—275.	18 by 9 (HEAT).
11	L90742	Mg, cal .30, lt, flex, M1919A6	600-675 (C)	75	150	3,200	1,100	NA.
12	L91975	Mg, cal .50, hv, flex, M2	450-500	40	100	6,800	AD tgts—725. Gnd tgts—1,825.	
13	L92386	Mg, 7.62-mm, lt, flex, M60	550 (C)	100	200 (rapid rate)	3,725	1,100	NA.
14	M68009	Mort, 81-mm, on mount, M29	12 (M) for first 2 min with charge 8.	3 with charge 8.	12 (M) for first 2 min with charge 8.	3,650	3,650	25 by 20 (A).

15	M68282	Mort, 107-mm, on mount, M30	20 (M) for first 2 min, 6 for next 20 min.	2	20 (M) for first 2 min, 6 for next 20 min, 2 indefinitely.	5,500	5,500	40 by 15 (A).
16	N96741	Pistol, cal .45, auto	35–42 (M)	10	21–28	1,500	50	NA.
17	R94977	Rifle, 5.56-mm, M16A1	750 (C) 45–65 (M) semi-automatic. 150–200 (M) auto.	Semiautomatic—12–15. Auto—20	Semiautomatic—20–40. Auto—40–60	2,653	460	NA.
18	R95114	Rifle, 7.62-mm, M14	700–750 (C)	Semiautomatic—15. Auto—20	Semiautomatic—20–40. Auto—40–60	3,725	460	NA.
19	R95525	Rifle, cal .30, M1		8–10	16–24	3,200	460	NA.
20	R96073	Rifle, cal .30, auto	350 (C) slow rate. 550 (C) fast rate. 120–150 (M).	40–60	120–150 (20-rd bursts).	2,750–3,200	460	
21	R96484	Rifle, rcl, 90-mm, M67	1 per 6 sec not to exceed 5, then 15 min cooling period.	1 per min indefinitely.		2,200 (approx)	Armor defeating—400. Other tgts—750.	
22	R96758	Rifle, rcl, 106-mm, on mount	1 per 6 sec not to exceed 5, then 15-min cooling period.	1 per min indefinitely.		7,678	Armor defeating: 1,100—moving. 1,100—stationary. Other tgts—2,200.	14-m radius (HEP-T).
23	U56346	Smg, cal .45, M3A1	450 (C)	40–60	40–60	1,550	100	NA.
24		Hand gren	NA	NA	NA	M26A2—40 M34—35	M26A2—40 M34—35	M26A2—15. M34—25.
25		Redeye msl sys	1 per 11–15 sec			Classified	Classified	

Table 4-29. Field Artillery Cannons and Rockets

1	2	3	4	5	6	7	8	9	10	11	12	13	14
									Effective area covered by impact (m)				
Line item number	Weapon	Travel weight (lb)	Maximum range (m)	Time to emplace (min)	On carriage traverse (mils)	Elevation limits (mils)	Rate of fire (rd per min)					Air transportability phase	Water-crossing capability
							Maximum	Sustained	Depth	Width	Radius of large fragments		
J97230	Gun, FA, SP, 175-mm.	62,100	32,700	3	1,066	+35—+1,156	1.5	0.5	35	95	518	III	Fordable 42-in.
K56981	How, hv, SP, 8-in, M110.	58,500	16,800	2	1,066	+35—+1,156	1.5	0.5	30	80	470	III	Fordable 42-in.
K57118	How, hv, towed, 8-in, M115.	29,700	16,800	20	1,066	−36—+1,156	1.5	0.5	30	80	470	III	Fordable 60-in.
K57255	How, lt, SP, 105-mm, M108.	46,221	11,500 [a] 15,400	1	6,400	−106—+1,333	10	3.0	20	30	175	III	Amph with kit.
K57392	How, lt, towed, 105-mm, M102.	3,140	11,500 [a] 15,400	4	6,400	−89—+1,333	10	3.0	20	30	175	I	Floatable.
K57529	How, lt, towed, 105-mm, M101A1.	4,980	11,000 [a] 14,700	3	809	−89—+1,156	10	3.0	20	30	175	I	Floatable.
K57666	How, mdm, SP, 155-mm, M109.	52,460	14,600	1	6,400	−53—+1,333	4	1.0	30	50	360	III	Amph with kit.
K57803	How, mdm, towed, 155-mm, M114A1.	12,700	14,600	5	866	0—+1,156	4	1.0	30	50	360	I	Fordable 30-in.
K57940	How, mdm, towed, 155-mm, M123A1.	13,540	14,600	5	866	0—+1,156	4	1.0	30	50	360	I	Fordable 30-in.
L45123	Lchr, rkt, multiple, 115-mm, M91.	1,200	10,600	30	356	0—+1,067	15 sec 45 rd.	15 sec 45 rd.	50 percent of rds—25 hectares. 95 percent of rds—114 hectares.			I	Fordable 30-in.
	Lchr, rkt, HJ, MGR-1B, M50.	4,719	38,000	[b]	533 [c] 356	+71—+1,067	3 per lchr per hr.	3 per lchr per hr.	----------			II	30- to 60-in.

[a] Extended range.
[b] See FM 6-61 for time.
[c] M33 lchr.

Table 4-30. Field Artillery Missiles

1	1 Weapon	2 Minimum and maximum range (nm)	3 Water-fording capability (in.)	4 Guidance	5 Propulsion	6 Mobility	7 Missile prime mover	8 Field of fire (mils from cen)*	9 Launch elevation (mils)	10 Length (m)	11 Missile weight (lb)		12 Diameter (in.)
											With warhead	Without warhead	
2	PERSH	100 to 400	42	Inertial	2-stage solid.	Veh—100 percent. Air—ph II.	XM474E2 (tracked veh).	2,225 (right and left).	1,600	10.5	10,275	9,500	40
3	SGT	25 to 75	30	Inertial	Solid	Veh—100 percent. Air—ph II.	Trac, 5-ton, M52.	3,111 (right and left).	1,333	10.5	10,022	8,411	30

*Fields of fire indicate system capabilities to attack targets without repositioning the launcher once it has been emplaced.

Table 4-31. Field Artillery Final Protective Fires.

1	Weapon (caliber and type)	Area effectively covered by one projectile (width by depth)	Radius of large fragments (m)	Width of battery sheafs			Permissible Number of rounds per piece	
				Size of battery			Maximum (rd per min)	Sustained (rd per min)
				2-piece	4-piece	6-piece		
2	105-mm how	30 by 20	174			180	M101A1—10	3. 0
							M52A1—10	3. 0
							M108—10	3. 0
							M102—10	3. 0
							M104—10	3. 0
3	155-mm how	50 by 30	357			300	M114A1—4	1. 0
							M44A1—4	1. 0
							M109—4	1. 0
							M53—4	1. 0
4	8-in how	80 by 30	476		320		M115—1. 5	0. 5
							M55—1. 5	0. 5
							M110—1. 5	0. 5
5	175-mm gun, M107	95 by 35	520		380		M107—1. 5	0. 5

Table 4-32. Field Artillery Targets

1	Area and ammunition	2	3	4	5
		Unit			
		105-mm bn	155-mm bn	175-mm bn	8-in bn
		6-piece btry.	6-piece brty	4-piece btry	4-piece btry
2	Approx size of area covered (m)*	220 by 160	350 by 210	420 by 140	340 by 140.
3	Amount of ammo to cover (rd)	72	72	60	60.

*The area covered effectively is considered that area in which there is at least 50-percent chance that a man standing will become a casualty. The area is roughly elliptical.

Table 4–33. Characteristics of Chemical Agents

1	2	3	4	5
Name and symbol	Odor	Effect on body	Persistency effect	Possible dispersion methods
Toxic chemical agents				
Distilled mustard, H_2D[1]	Like garlic or horseradish.	Injures eyes and lungs; blisters skin	Up to several weeks	Artillery, bomb, landmine, mortar, rocket, spray.
Nerve agent, GB[1]	Odorless	Causes blurred vision with pinpointing of pupils, skin and eye spasms, difficult breathing, tightness in chest, salivation, mental confusion, convulsions, death.	Up to 12 hours	Artillery, bomb, landmine, mortar, rocket, spray.
Nerve agent, VX	Odorless	Similar to effects from GB	Long duration	Rocket, mine, artillery, mortar.
Incapacitating agents				
O-chlorobenzalmalononitrile, CS	Like pepper	Causes tears; irritates skin; and acts as a vomiting agent. May cause temporary pain in chest.	----------	Candle, grenade, mechanical disperser.
Incapacitating agent, BZ		Causes temporary slowing of mental and physical activity, disorientation, and hallucinations.	----------	Bomb, thermal generator.
Screening smokes				
Hexachlorethane-zinc oxide mixture, HC.[2]	Slightly acrid	30-minute exposure to ordinary concentration harmless; 1-hour exposure to heavy concentration may irritate nose and throat and cause illness; heavy metal poisoning possible with prolonged exposure.	Subject to atmospheric conditions.	Artillery, bomb, grenade, mortar, pot, rocket.
Sulfur trioxide in chlorosulfonic acid, FS.[2]	Acrid	Smoke not toxic in ordinary concentration; high concentration irritates eyes, throat, and chest and may cause illness; liquid is corrosive and burns skin.	Subject to atmospheric conditions.	Artillery, mortar, rocket, spray.
Fog oil, SGF2[3]	Like petroleum oil.	Prolonged exposure can irritate lungs and throat.	Subject to atmospheric conditions.	Smoke generator, grenade, pot.
White phosphorus, WP[4]	Like burning matches.	Smoke is harmless; solid particles burn flesh.	Subject to atmospheric conditions.	Artillery, bomb, grenade, mortar, rocket.
Plasticized white phosphorus, PWP	Like burning matches.	Same effect on body as WP	2–3 minutes	Artillery, bomb, grenade, mortar, rocket.

See footnotes at end of table.

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Table 4-33. Characteristics of Chemical Agents—Continued

1	Name and symbol	Odor	Effect on body	Persistency effect	Possible dispersion methods
	Signaling smokes				
12	Green smoke, GS	Acrid		Subject to atmospheric conditions.	Artillery, bomb, grenade.
13	Red smoke, RS	Acrid		Subject to atmospheric conditions.	Artillery, bomb, greande.
14	Violet smoke, VS	Acrid		Subject to atmospheric conditions.	Artillery, bomb, grenade.
15	Yellow smoke, YS	Acrid		Subject to atmospheric conditions.	Artillery, bomb, grenade.

[1] Requires protective clothing and mask.
[2] Mask required in dense concentrations.
[3] Used when air temperature is between −18° and 5° C.
[4] Secondary tactical classification is an antipersonnel agent; agent also has some incendiary effect.

Table 4-34. Characteristics of Chemical Munitions

1	2 Line item number	2 Munition	3 Agent symbol	4 Weight of filled munition (lb)	5 Burning time (min)	6 Radius of burst (m)	7 Standard color coding system: Number and color of bands	8 Standard color coding system: Base (primary use)
		Hand grenades						
2	J77626	Gren, hand, green-smoke, M18	GS	1.20	1	NA	None	Light-green background; black lettering.
3	J77763	Gren, hand, incd, TH3, AN-M14	TH3	2.00	½	NA	None	Light red; black lettering.
4	J78757	Gren, hand, riot con, type CS1, M25A2.[5]	CS1	0.50	NA	5	1 red	Gray; red lettering.
5	J79133	Gren, hand, red-smoke, M18	RS	1.20	1	NA	1 light green	Olive drab; light-green lettering.
6	J79270	Gren, hand, riot, CN1, ABC, M25A2.	CN1	0.50	NA	5	1 red	Gray; red lettering.
7	J79544	Gren, hand, riot, CS, M7A3	CS	1.00	¼ to ½	NA	1 red	Gray; red lettering.
8	J79681	Gren, hand, smoke, ABC, AN-M8	HC	1.60	2	NA	None	Light green; black lettering.
9	J79818	Gren, hand, violet-smoke, M18	VS	1.20	1	NA	1 light green	Olive drab; light-green lettering.
10	J79955	Gren, hand, yellow-smoke, M18	YS	1.20	1	NA	1 light green	Olive drab; light-green lettering.
11	J80092	Gren, hand and rifle, smoke, WP, M34.	WP	1.69	1	35	1 yellow	Light green; light-red lettering.

		Flamethrower						
12	K67817	Ignition cyl, flamethrower, M1	NA	0.10	1/10 to 1/5	NA	None	Light red; black lettering.
		Incendiaries						
13	C39059	Burster, incd, fid, M4	Incd	2.25	NA	35	1 yellow	Light red; black lettering.
14	F52132	Crypto equip destroyer, incd, TH4, M1A2, M2A1.	TH4	34.00	1	NA	None	Light red; black lettering.
15	G33315	Docu destroyer, emerg, incd, M3	Incd	117.00	20	NA	None	Light red; black lettering.
16	H40472	File destroyer, emerg, incd, M3	Incd	117.00	20	NA	None	Light red; black lettering.
		Landmine						
17	M48959	Mine, gas, persistent, VX, 2-gal, ABC and M23.	VX	22.75 (unfuzed)	NA	NA	3 green, 1 yellow.	Gray; green lettering.
		Smokepots and signals						
18	T52025	Sig, gnd, green-smoke, prcht, M128E1.	GS	1.16	1/4	NA	None	Light green; black lettering.
19	T52162	Sig, gnd, red-smoke prcht, M129E1	RS	1.16	1/4	NA	None	Light green; black lettering.
20	T84505	Smokepot, HC, 30-lb, M5	HC	33.00	12 to 22	NA	None	Light green; black lettering.
21	T84657	Smokepot, fltg, HC, M4A2	HC	38.00	10 to 15	NA	None	Light green; black lettering.
		Fire starter						
22	U30201	Starter, fire, NP3, M2	NP3	0.03	4	NA	None	Light red; black lettering.
		Rockets						
23	S03725	Rkt, gas, nonpersistent GB, 115-mm, M55.	GB	55.00	NA	NA	3 green, 1 yellow.	Gray; green lettering.
24	S03862	Rkt, gas, persistent, VX, 115-mm, M55.	VX	56.00	NA	NA	3 green, 1 yellow.	Gray; green lettering.
		81-mm mortar						
25	D50165	Ctg, 81-mm, smoke, WP M370.	WP	9.34	NA	20 to 30	None	Light green; light-red lettering.
		90-mm gun						
26	D51535	Ctg, smoke, WP, 90-mm gun, M313.	WP	23.64	NA	15 to 30	None	Light green; light-red lettering.
27	D51672	Ctg, 90-mm, smoke, WP, M313C.	WP	23.57	NA		None	Light green; light-red lettering.

Table 4–34. Characteristics of Chemical Munitions—Continued

1	2	3	4	5	6	7	8
Line item number	Munition	Agent symbol	Weight of filled munition (lb)	Burning time (min)	Radius of burst (m)	Standard color coding system	
						Number and color of bands	Base (primary use)
	105-mm howitzer						
28 D54275	Ctg, 105-mm, gas, HD, M60.	HD	43. 27	NA	NA	2 green	Gray; green lettering.
29 D54412	Ctg, smoke, WP, 105-mm how, M60.	WP	34. 83	NA	20 to 40	None	Light green; light-red lettering.
30 D54960	Ctg, green-smoke, BE, 105-mm how, M84.	GS	30. 48	1 to 4	NA	None	Light green; white lettering.
31 D55097	Ctg, smoke, HC, BE, 105-mm how, M84.	HC	32. 86	1 to 4	NA	None	Light green; white lettering.
32 D55234	Ctg, red-smoke, BE, 105-mm how, M84.	RS	30. 68	1 to 4	NA	None	Light green; white lettering.
33 D55508	Ctg, yellow-smoke, BE, 105-mm how, M84.	YS	30. 29	1 to 4	NA	None	Light green; white lettering.
34 D56878	Ctg, gas, nonpersistent, 105-mm how M360.	GB	35. 59	NA	NA	3 green	Gray; green lettering.
35 ----------	Canister, green-smoke, 105-mm shell, M2.	GS	40. 30	2	NA	None	Light green; black lettering.
36 ----------	Canister, red-smoke, 105-mm shell, M2.	RS	40. 50	2	NA	None	Light green; black lettering.
37 ----------	Canister, smoke, HC, 105-mm shell, M1.	HC	42. 70	3	NA	None	Light green; black lettering.
38 ----------	Canister, violet-smoke, 105-mm shell, M2.	VS	40. 30	2	NA	None	Light green; black lettering.
39 ----------	Canister, yellow-smoke, 105-mm shell, M2.	YS	40. 10	2	NA	None	Light green; black lettering.
40 D59344	Ctg, gas, persistent, HD, 4.2-in. mort, M2A1.	HD	23. 50	NA		2 green	Gray; green lettering.
41 D59481	Ctg, smoke, WP, 4.2-in. mort, M328	WP	28. 66	NA	20 to 50 [a]	None	Light green; light-red lettering.
	120-mm gun						
42 P69501	Proj, 120-mm, smoke, WP–T, M357	WP	50. 30	NA	50 [a]	None	Light green; light-red lettering.
	155-mm howitzer						
43 P72789	Proj, gas, persistent, HD, 155-mm how, M110.	HD	94. 00	NA		2 green	Gray; green lettering
44 P73063	Proj, green-smoke, BE 155-mm how, M116B1.	GS	86. 44	½ to 4	NA	None	Light green; white lettering.
45 P73200	Proj, smoke, HC, BE, 155-mm how, M116B1.	HC	94. 35	1 to 4	NA	None	Light green; white lettering.

46	P73337	Proj, red-smoke, BE, 155-mm how, M116B1.	RS	86.44	½ to 4	NA	None	Light green; white lettering.
47	P73611	Proj, yellow-smoke, BE, 155-mm how, M116B1.	YS	86.44	½ to ¼	NA	None	Light green; white lettering.
48	P73885	Proj, gas, nonpersistent, GB, 155-mm how, M121A1.	GB	----------	NA	(b)	3 green	Gray, green lettering.
49	P74022	Proj, gas, persistent, VX, 155-mm how, M121A1.	VX	----------	NA	(b)	3 green	Gray, green lettering.
50	----------	Canister, violet-smoke, 155-mm shell, M3.	VS	86.40	1 to 3	NA	None	Light green; black lettering.
51	----------	Canister, violet-smoke, 155-mm shell, M4.	VS	86.40	½ to 3	NA	None	Light green; black lettering.
52	----------	Canister, yellow-smoke, 155-mm shell, M3.	YS	86.40	1 to 3	NA	None	Light green; black lettering.
53	----------	Canister, yellow-smoke, 155-mm shell, M3.	YS	86.40	½ to 3	NA	None	Light green; black lettering.
54	----------	Canister, green-smoke, 155-mm shell, M4.	GS	86.44	1 to 3	NA	None	Light green; black lettering.
55	----------	Canister, green-smoke, 155-mm shell, M4.	GS	86.40	½ to 3	NA	None	Light green; black lettering.
56	----------	Canister, red-smoke, 155-mm shell, M3.	RS	86.40	1 to 3	NA	None	Light green, black lettering.
57	----------	Canister, red-smoke, 155-mm shell, M4.	RS	86.40	½ to 3	NA	None	Light green; black lettering.
58	----------	Canister, smoke, HC, 155-mm shell, M1.	HC	95.10	2 to 4	NA	None	Light green; black lettering.
59	----------	Canister, smoke, HC, 155-mm shell, M2.	HC	94.35	1 to 4	NA	None	Light green; black lettering.
		8-in howitzer						
60	P75392	Proj, gas, nonpersistent, GB, 8-in how, M426.	GB	----------	NA	(b)	3 green	Gray; green lettering.
61	P75529	Proj, gas, persistent, VX, 8-in how, M426.	VX	----------	NA	(b)	3 green	Gray; green lettering.
		Rocket warheads						
62	Y25286	Whd sec, 762-mm rkt, gas, nonpersistent, GB, M190.	GB	1,716.00	NA	(b)	3 green, 1 yellow.	Gray; green lettering.
63	----------	Whd sec, GM, gas, nonpersistent, GB, M212.	GB	2,069.00	NA	(b)	3 green, 1 yellow.	Gray; green lettering.

[a] For antipersonnel effect.
[b] Information is classified.

Section V. SIGNAL COMMUNICATIONS

4-19. General

a. These data are intended for use as a general guide. The highly technical nature of signal operations and varying security measures require that these data be applied only as recommended by the unit signal officer after modification to local field conditions and in the light of the tactical situation.

b. For signal troop requirements in a typical field army, see paragraph 4-2 and table 4-4.

c. For signal troop requirements in the TASCOM, see paragraph 4-3; in airborne operations, see paragraph 4-4; and in amphibious operations, see paragraph 4-5.

d. For signal construction factors, see paragraph 8-13.

e. For characteristics of target acquisition and combat surveillance equipment, see FM 101-10-3.

f. Publications Governing Signal Communications.

(1) Pertinent sections of the unit SOP set forth the general principles under which the unit signal system will operate. Usually, the SOP is governed by the provisions of the SOP of the next higher headquarters and, in turn, serves as a guide for that of subordinate headquarters.

(2) The standing signal instructions (SSI) explain the use of items included in the signal operation instructions (SOI). SSI at various command echelons are identical or similar in content. Instructions that are identical in several commands are prepared and distributed by the highest common command when such centralized preparation is feasible.

(3) SOI contain the specific technical directions for the operation of the various means of signal communications. They include separate items providing such information as telephone directory code names and numbers, radio call signs and frequencies, unit code and ciphers, and pyrotechnic signals. Because changes in items of SOI occur frequently, paragraph 5 of the field order specifies the curent index.

(4) Joint Army-Navy-Air Force Publications (JANAP) and Allied Communication Publications (ACP) contain joint and combined instructions, methods, and procedures pertaining to communications planning and operations.

4-20. Users Served by the Signal Communications System

The military signal communications system in a theater of operations provides service for the following:

a. Signal communications in the combat zone.
(1) Division.
(2) Corps.
(3) Field army.
(4) Army group.

b. Signal communications in the COMMZ.
(1) TASCOM.
(2) Personnel command.
(3) Supply and maintenance command.
(4) Engineer command.
(5) Transportation command.
(6) Medical command.
(7) Area support command.
(8) Interzonal services.
(9) Other command headquarters.

c. Communications facilities as required for—
(1) AD.
(2) Coordination of Army and Air Force activities, including facilities for the request of air support.
(3) Coordination of Army and Navy activities.
(4) MP activities, including traffic control.
(5) Personnel replacement systems.
(6) Intelligence and counterintelligence activities.
(7) CA.
(8) PSYOP.
(9) Press, public relations, and special services activities.
(10) Guided-missile installations and activities.
(11) Clandestine and guerrilla warfare.
(12) Interallied signal communications.
(13) Electronic warfare.
(14) Meteorological service.
(15) Signal security activities.
(16) Air traffic control.
(17) Air navigation systems.
(18) Identification, friend or foe, systems.
(19) Automatic data processing systems.
(20) Military highway communications.
(21) POL supply.

4-21. Field Army Communication System

a. General. The field army communication system (FACS) provides the field army commander with a reliable signal communications system with which to influence the tactical operations of subordinate units. The system also provides signal communications to combat support and combat service support units, which enable them to react rapidly and keep pace with the combat forces. The FACS consists of a command communications system and an area communications system, which are provided by the army signal brigade assigned to the field army. Each major headquarters installation at field army, corps, and division has sufficient signal personnel and equipment to install, operate, and maintain a complete command post communications system.

b. Command Communications System. The command communications system is developed along command lines, from senior to each subordinate, and connects with adjacent field army headquarters and allied force headquarters or both. The system interconnects echelons of field army headquarters with echelons of major subordinate fire and maneuver element headquarters such as corps, field army artillery, separate division or brigade supporting field army headquarters, and other designated units.

c. Area Communications System. The area communications system provides long-distance signal communications links on an area basis for combat support and combat service support units. It also acts as a backup or alternate system for the command communications system when this system is disrupted by displacement of tactical headquarters, enemy action, natural disasters, or other causes. The area system is not limited to the boundaries of the units it serves, but is established along several longitudinal axes with multiple lateral interconnections between signal centers. The signal centers have sufficient communications facilities to enable the movement of command posts from one location to another without disruption of the overall system and provide the maximum number of alternate routes for message handling to reduce the probability of interruption of communications between major units.

4-22. Communications Center

a. Function. The function of the communications center (COMMCEN) is to transmit, receive, and deliver messages by the most reliable means. The figures in tables 4-35 through 4-37 apply to COMMCEN operations and are based on World War II experience. Under present and future concepts of operations, the accuracy of these figures may vary widely.

b. Cryptographic Operations. Table 4-35 is computed from after-action reports of selected units in the European Theater of Operations (ETO) during World War II. It includes messages sent by radio, teletypewriter, and miscellaneous means.

Table 4-35. Cryptographic Operations

1	2	3	4	5
Item	Division	Corps	Field army	Army group
Average code groups per month	225, 000	500, 000	750, 000	1, 800, 000

c. Precedence. Table 4-36 shows the nomenclature for classes of precedence. It was compiled from after-reaction reports in the ETO during World War II and has been changed to conform to present usage.

d. Speed of Transmission. Table 4-37 shows the average speed of transmission for various message media.

Table 4-36. Classes of Precedence (Percentage)

1	2	3	4	5
Item	Flash	Immediate	Priority	Routine
Percentage of all messages (field army headquarters).	2	36	23	39

Table 4-37. Speed of Transmission

1	2
Method of transmission	Approximate transmission rate (WPM)[1]
Panels (15 code groups per hour)	0. 25.
CW manual telegraph (wire or radio, one-way):[2]	
Average operator (hand printed)	12-15.
Skilled operator (typewritten)	25-40.

See footnotes at end of table.

Table 4-37. Speed of Transmission—Continued

1	2	3
	Method of transmission	Approximate transmission rate (WPM)[1]
	Teletypewriter (wire or radio, one-way):	
5	Average operator (keyboard operation)	25–40.
6	Tape operation (on one telegraph circuit)	60 or 100.
7	Tape operation (on one voice circuit, 16 tape circuits).	960 or 1,600.
	Facsimile (wire or radio, one-way, weather map-size copy or two 8 by 10½ pages in 20 minutes):[2]	
8	Average text per page (400 words)	40.
9	Completely filled page, no margins or blank space (1,000 words).	100.
	EAM data cards (wire or radio, one-way, fully punched, 80 columns or 13 words per card):	
10	On a 60-WPM telegraph circuit	39.
11	On a 100-WPM telegraph circuit	65.
12	On a 3-kilohertz voice circuit (11 cards per minute).	143.
13	Maximum on voice circuit (4 by 11 cards per minute).	572.
	Fieldata messages (wire or radio, one-way, 8 bits per character):	
14	Paper tape on telegraph circuit	60 or 100.
15	Paper tape on a 3-kilohertz voice circuit.	Up to 600.
16	Magnetic tape on average voice circuit.	Up to 1,500.
17	Magnetic tape on special voice circuit.	Up to 3,000.
18	Magnetic tape on 48-kilohertz 12-voice-channel group.	Up to 24,000.
19	Magnetic tape on 1-megahertz video circuit.	Up to 500,000.
	Telephone (or voice on wire or radio, one-way):	
20	Push-to-talk operation (radiotelephone).	80–120.
21	Average talker	100–150.
22	Fast talker reading clear text	150–250.
23	Enciphered code groups using phonetic alphabet.	15–20.

[1] One word equals 5 characters plus a space.

[2] Simplex, half-duplex, one-way-at-a-time, or one-way automatic-reversible operation speeds are the same as for one-way. The total operation speed for both directions of full-duplex operation is equal to twice that of one-way operation.

4–23. Means of Signal Communications

a. General.

(1) *Military messages.* Military messages are transmitted by —

(*a*) Messenger, including scheduled and special foot, motor, and aircraft messengers and officer couriers.

(*b*) Wire circuits, including telephone, teletypewriter, and facsimile.

(*c*) Visual, including flags, panels, lamps, and pyrotechnics.

(*d*) Sound, including whistles, horns, loudspeaker systems, and small-arms fire.

(*e*) Radio circuits, including teletypewriter, voice, continuous wave (CW), facsimile, and data and special transmissions.

(*f*) Ancillary devices, such as data processing and transmission facilities and special communications devices.

(2) *Use of signal communications means.* Messenger, wire, and radio relay are used for communications within and between division, corps, field army, and higher headquarters. Besides these means, visual and sound systems are used in air-ground signaling, in amphibious operations, for emergency communications within small units, and as warning signals.

b. Radio.

(1) *General.* The traffic handled by radio—exclusive of messages handled by radio-relay equipment installed as part or in lieu of the wire net—depends on the type of unit and the rate of movement. In general, radio forms a standby means of communications during static conditions when its operation would provide information subject to enemy interception and analysis. However, in fast-moving situations when it is difficult to extend wire lines rapidly enough and when units disperse on a wide front, radio becomes a major means of communications.

(2) *Radio traffic.* Table 4–38 contains radio traffic data based on selected units in the ETO during World War II.

c. Television. Military television is currently limited to noncombat applications in the CONUS and the COMMZ, e.g., training and conferences.

Table 4-38. Radio Traffic

1	1 Item	2 Armored division	3 Infantry division	4 Corps	5 Field army	6 Army group
2	Average messages per month	2, 400	200	500	9, 500	3, 800
3	Average code groups or words per month		35, 000	85, 000	163, 000	650, 000

d. Wire.

(1) *General.* Wire communications networks generally provide a more secure means of electrical transmission of messages than radio. Relative security depends on geographic location of the net, the tactical situation, local security measures, the type of equipment being used, and the type of conductor employed in the line. The transmission of classified messages in the clear over these circuits is resorted to only when the urgency of the tactical situation outweighs the security requirements.

(2) *Telephone.* Each headquarters has enough telephone facilities to satisfy normal operating requirements, provided proper use is made of written messages for traffic not adapted to telephonic transmission. Table 4-39 shows the average number of calls per day handled by switchboards in major headquarters in the ETO during World War II.

Table 4-39. Telephone Traffic

1	1 Item	2 Division	3 Corps	4 Field Army	5 Army group
2	Calls per day	2, 000	5, 000	12, 500	18, 000

(3) *Teletypewriter.* Table 4-40 shows the average number of teletypewriter messages handled by various types of headquarters in the ETO during World War II.

Table 4-40. Teletypewriter Traffic

1	1 Item	2 Division	3 Corps	4 Field Army	5 Army group
2	Messages per month	750	4, 000	11, 500	28, 000

(4) *Construction.* For figures on permanent and semipermanent wire construction, see paragraph 8-13.

(*a*) Table 4-41 shows the rates of wire line construction.

Table 4-41. Rates of Wire Line Construction.

1	1 Type of wire	2 Foot troops	3 Reel trucks	4 Signal construction battalion
2	Field wire	2½ kmph per 3-man team.	5-8 kmph per 6-man team.	
3	Spiral-4 cable (on existing support).	----------	1½ kmph per 8-man team.	
4	Open wire (10-wire pole line).	----------	----------	48 km per week.

(*b*) Table 4-42 shows the rates of construction for field wire, cable, and open wire laid to next subordinate headquarters by selected units in the ETO during World War II.

Table 4-42. World War II Experience Data on Wire Line Construction

1	1 Kilometers per month of—	2 Division	3 Corps	4 Field Army
2	Field wire	700	----------	
3	Cable and field wire		1, 100	2, 100
4	Open wire			800

(*c*) Table 4-43 shows the average rates of repair of wire lines by a division signal company over a 6-month period in the ETO during World War II.

Table 4-43. Rates of Wire Line Repair

	1	2	3	4
1	Item	Daylight	Night	Average time out day and night
2	Elapsed time in minutes.	70	120	95

e. Comparison Between Radio-Relay and Wire Circuit Installation Times (fig. 4-9). The times shown in figure 4-9 include site survey and selection, travel time, equipment, and antenna installation if all sites are accessible to vehicles. Wire facilities are based on a 12-hour day, considering losses due to loading, travel, supply, and vehicle maintenance; capability is for an eight-man team.

f. Messenger.

(1) Table 4-44 lists the rates of travel of various types of messengers, with no consideration to traffic restrictions, climate, or weather.

Table 4-44. Rates of Travel of Messengers

	1	2	3
1	Kind of messenger	Rate of travel (kmph)	
		Day	Night
2	Dismounted (runner)	5-8	3-6
3	Motor	40-65	24-50
	Aircraft:		
4	Fixed-wing	145-260	145-260
5	Rotary-wing	96-160	96-160

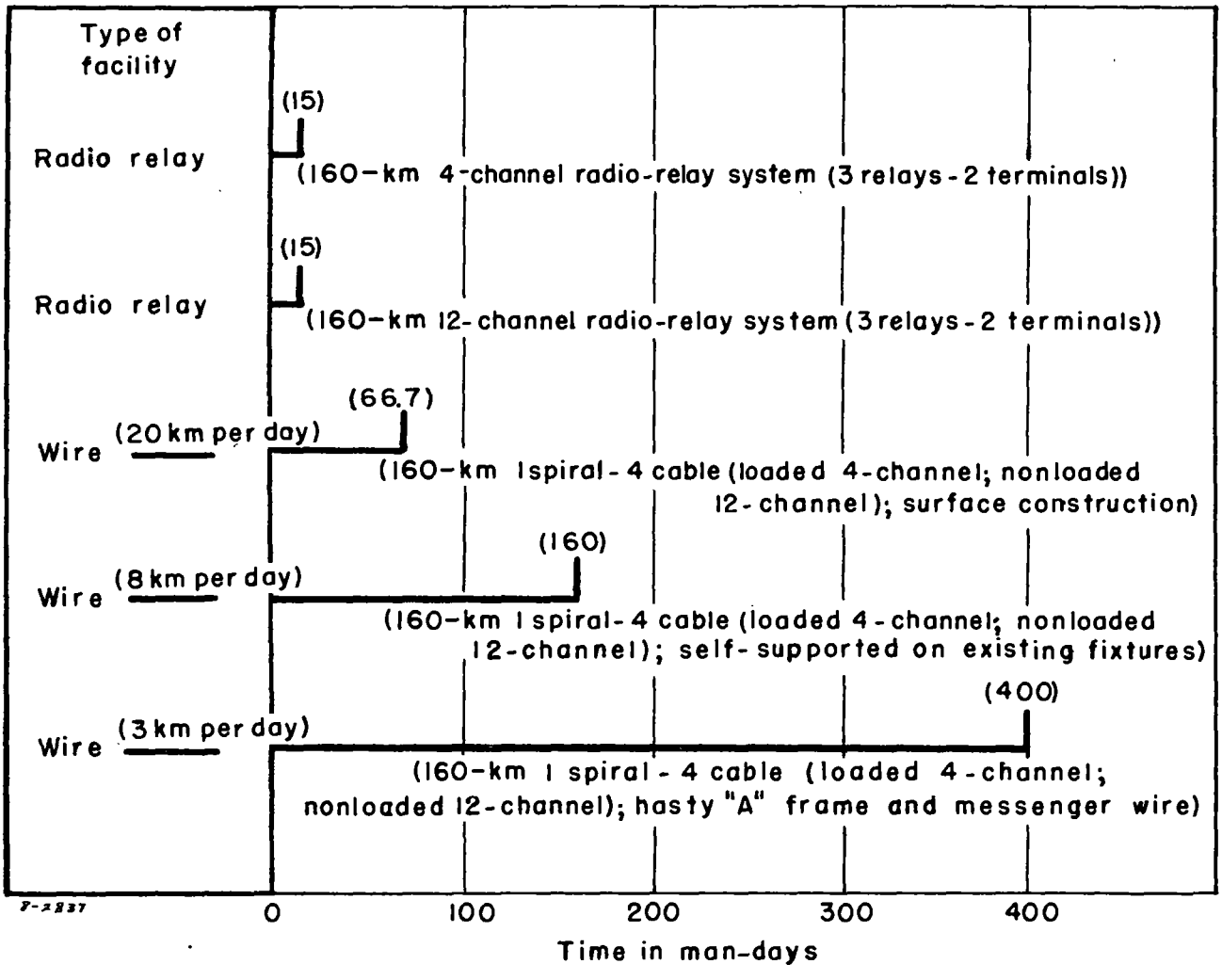

Figure 4-9. Radio-relay and wire circuit installation times.

(2) Each headquarters receives organic messenger facilities. Motor messenger carries the bulk of messenger traffic. Table 4-45 indicates the capabilities of motor messenger service available to units.

Table 4-45. Messenger Traffic

1	2	3	4
Item	Division	Corps	Field arm
Kilometers of route per month	11, 265	48, 280	144, 841
Pouches and messages	17, 000	50, 000	150, 000

(3) Accounting for messages in the COMM CEN by pouch rather than by individual message increases the quantity of messages that a messenger can transmit and the speed of transmission.

4-24. Special Communications Requirements

a. General. Certain intersectional services require special communications facilities. Whenever possible, these requirements are integrated into the theater army communication system (TACS). Special requirements of these services are presented in *b* through *e* below.

b. Military Railway Service Communications Data. A military railway service communications system normally consists of open wire facilities. VHF radio and VHF/UHF radio relay are *ultimate oversea necessities.*

(1) Two metallic pairs are required to provide the telephone and teletypewriter circuits needed. Open wire leads may or may not closely follow the railway, but circuits must be available at each way station and dispatcher's office.

(2) Associated equipment with open wire lines usually consists of telephone dispatching equipment, simplex and composite sets, telephone and telegraph voice-frequency repeaters and may include use of telephone carrier facilities.

(3) VHF radio may be used in railroad yard areas for yard-to-engine operation.

(4) VHF/UHF radio relay may be used between adjacent division dispatcher's offices and from division dispatcher to way stations where wire lines experience frequent outages because of hostile action and where backup communications are required. It is valuable also during operations requiring speed of installation.

(5) Circuit requirements include—

(*a*) Dispatcher to way stations.

(*b*) Way station to way station.

(*c*) Dispatcher to dispatcher.

1. Telephone.

2. Teletypewriter.

(*d*) Division headquarters to military railway service headquarters.

1. Telephone.

2. Teletypewriter.

c. Military Pipeline Communications Data.

(1) Military pipeline communications may be provided on allocated channels of the TACS. In geographic areas where it is not feasible to use this system, a separate radio-relay system will be installed; and, when practicable, it will be integrated with the TACS.

(2) VHF radio facilities are provided at each pumping station, tank farm complex, and district dispatcher's office for communications to airmobile and ground mobile units. This equipment also provides emergency communications between these elements.

(3) High-frequency radio facilities are provided for emergency communications between the chief dispatching station and each district dispatcher.

(4) Equipment associated with the system consists of telephone dispatching systems, teletypewriter sets, simplex and composite sets, telephone and telegraph voice-frequency repeaters and may include telephone carrier systems.

(5) For planning purposes 65 percent of the total pipeline communications circuit requirements in an oversea theater will be provided from the TACS. This estimate is based on the assumption that the pipelines and the axes of the TACS generally coincide. The remaining 35 percent by the pipeline communications circuit requirements will be provided by the Signal Corps as separate construction to support the POL system.

d. Military Highway Communications Data.

(1) A military highway communications system usually consists of fixed VHF radio stations located at strategic intervals of from 60 or 80 kilometers. These stations may be adjacent to the traffic control posts (TCP) and highway regulation points or may be at the same location. The fixed radio stations are connected to the nearest theater army signal switching center for access to

the integrated TACS. This connection also enables the strategically located highway radio stations, TCP's, and highway regulation points to communicate with one another and with ports, depots, headquarters, and other areas.

(2) The fixed VHF radio stations enable radio-equipped vehicles, normally MP and some transportation or ordnance vehicles, to communicate with the nearest TCP and highway regulation point while moving or stopped. All such radio contact depends on the terrain, location of fixed and vehicular radio sets, and other factors affecting radio transmission.

(3) Besides radio and telephone communications between fixed and vehicular radio stations, telephone and teletypewriter circuits are provided by the open wire or radio-relay facilities between the fixed radio stations serving the TCP's and the highway regulation points.

(4) Signal units operate the fixed radio stations to provide maximum economy of equipment, radiofrequencies, speed of service, and efficiency to the various services and units requiring communications along the military highway system. At each fixed radio station signal personnel also operate a small switchboard, when required, with local telephone connections to the various adjacent services operating the TCP's and the highway regulation points. In some instances the fixed radio station will be located at or near a theater army signal switching center or a local signal center and will use its switchboard facilities.

e. AD Communications Data.

(1) AD tactical success depends to a large extent on a reliable communications system. Precise track information on airborne targets and command and control data must be rapidly and accurately exchanged if AD is to accomplish its assigned tasks.

(2) AD missile units in a theater of operations are normally linked together with an electronic fire distribution system (missile monitor). The use of this fire distribution system demands the instantaneous exchange of automatic data link and voice information between various echelons of the air defense command (ADC).

(3) As presently established, the FACS does not possess the capability to provide AD units with a sufficient number of circuits to satisfy their needs. Future proposed increases in the traffic handling capability of the FACS may make its use in AD feasible.

(4) A VHF/UHF radio-relay system is established by signal detachments provided to AD units by attachment of appropriate personnel from TOE 11-500D (see para 4-2*a*). The equipment used is basically the same as that used to establish the FACS and provides generally the same capabilities. VHF/UHF radio-relay facilities are established at each AD unit, using the missile monitor system and providing the following channels:

(*a*) Automatic data link.
(*b*) Command ("hot loop").
(*c*) Intelligence and radar reporting.
(*d*) Administrative and maintenance.

(5) If an electronic fire distribution system is not used, the necessary data are exchanged over communications nets established by radios organic to the AD units. If fire distribution system equipment is available, the TOE radios provide a backup means of communications.

4-25. Signal Pictorial Services

Division, corps, and field army use still and motion-picture ground photography, air still photography, and still-picture laboratory processing services. Units from theater army provide film and equipment and television services. Facilities to provide these various services are available in differing degrees, commensurate with the pictorial requirements at these levels of command. Pictorial facilities at division are used almost exclusively for tactical purposes. At corps and above they are used more extensively for historical record, administrative purposes, training, and information. However, each level of command is responsible for providing pictorial support to its subordinate units; when such support is for tactical purposes, requests from subordinate units get priority. Table 4-46 shows the pictorial facilities of a field army.

4-26. Characteristics of Communications-Electronics Equipment

FM 24-19 lists the nomenclature, description, range, and appropriate remarks for each category of communications-electronics equipment.

Table 4–46. Pictorial Facilities of a Field Army

1	1 Unit	2 TOE	3 Ground cameras	4 Aerial cameras (acft)	5 Aerial cameras (drone)	6 Motion-picture cameras	7 Still-photographic laboratory	8 Motion-picture laboratory
2	Avn GS co, avn bn, inf div	1–78G		X	X		X	
3	Corps avn co	1–127D		X			Svc from corps sig bn.	
4	Army avn co	1–137D		X			Svc from fld army.	
5	Avn co, abn SF gp	1–307E		X			X	
6	HHC, corps sig bn	11–16D	X			X	X	Svc from thtr.
7	Sig spt op co, sig bn, armd, inf, and inf (mech) div	11–39G	X			X	X	Svc from thtr.
8	HHC, army comd sig op bn	11–96G	X			X	X	Svc from thtr.
9	Sig co, abn SF gp	11–247G	X			X	X	Svc from thtr.
10	HHC, MI bn, air recon spt, fld army	30–6G	These units have special laboratory equipment for Army reproductions of Air Force airphotographs.					
11	MID, air recon spt, fld army	30–7G						
12	PSYOP teams	33–500G	X			X	X	

SECTION VI. FIELD ENGINEERING

4–27. General

These data are for general guidance only. Their application will vary with local field conditions in each specific tactical situation, based on the recommendation, after reconnaissance, of the unit engineer charged with the task.

4–28. Roads and Bridges

a. Load Capacity of Civilian Bridges. Peacetime design includes high safety factors for unusual loads and deterioration. As a guide for military operations it may be assumed that the ordinary civilian bridge in good condition will carry twice the rated civilian capacity when restrictons are placed on the speed and spacing of vehicles and on the number of lanes in use. However, an engineer officer should analyze the bridge capacity.

b. Road Capacity. The capacity of the bridge usually limits the capacity of the road thereon.

c. Marking Bridges and Vehicles.

(1) Two types of signs mark bridges—circular and rectangular. Circular signs, by means of symbols and numerals, indicate the one-way capacity classification of a bridge, wheeled or tracked class or both, as well as the capacity classes of a two-lane bridge when used as either a double- or a single-lane bridge. The marking for capacity of two-way bridges is vertical arrows under two respective one-way and two-way class numbers. When dual classification of bridges is to be posted, the wheeled and tracked classes are denoted by silhouette-type symbols together with the appropriate class numbers. When desired, rectangular signs located beneath the bridge class signs indicate any other information concerning the bridge, such as height or width limitations. Any bridge class that is a fraction of a whole number is *reduced* to the next *lower* whole number, e.g., 22.7 is reduced to 22. Figure 4–10 illustrates typical bridge markings.

(2) Vehicles are marked with class numbers that represent the effect a vehicle will have on the bridge when crossing it; the effect is determined from the gross weight of the vehicle and the weight distribution. Classification numbers are assigned to all single vehicles in military use having a gross weight in excess of 3 tons and to all

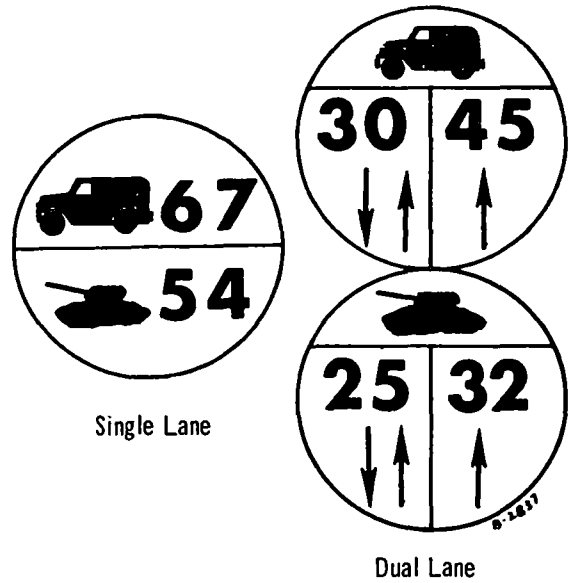

Figure 4–10. Typical bridge classification signs.

trailers in military use having a rated payload in excess of 1½ tons. All *single* vehicles in excess of 3-ton gross weight carry front class signs only; a side vehicle classification sign is placed on the right side of classified *towing vehicles* and *trailers* in excess of 1½ tons. For *combination* vehicles each leading vehicle in the combination carries a front vehicle classification sign. It is inscribed with the classification number of the combination with the letter C in red above the classification number. In addition, each vehicle in the combination carries a side vehicle classification sign inscribed with its classfication as a single vehicle. When vehicles and the vehicles they are towing are less than 30 meters apart and are on one bridge span at the same time, they are classed as combination vehicles. In these cases, the classification of the combination is the sum of the classification numbers of the separate vehicles. This combination classification number is shown on a temporary front sign. Special-purpose vehicles are equipped with front classification signs or side classification signs, depending on their means of propulsion. For more detailed information, see FM 5–36.

d. Engineer Road Construction. Table 4–47 shows effective man-hours required for personnel of the engineer CB to clear, grub, strip, and rough grade 1 mile of combat road, pioneer type.

Table 4-47. Road Construction (Man-Hours)

1	1 Terrain	2 One-way (4.2m (14 ft))	3 Two-way (7.3m (24 ft))
2	Flat—prairie	1, 500	2, 200
3	Rolling	2, 000	2, 800
4	Hilly—forested	2, 500	3, 300

4-29. River- and Gap-Crossing Equipment

a. Table 4-48 shows the distribution of river- and gap-crossing equipment to divisional and nondivisional units. The infantry division engineer battalion is issued equipment from either column 3 or column 4. The armored and infantry (mechanized) division engineer battalions are issued equipment from either column 5 or column 6. If conventional bridging is issued, the unit is authorized either M4T6 (LIN C25072) or class-60 (LIN C25346) equipment but not both.

b. Table 4-49 lists the characteristics of assault boats. The load figures in the last column are based on the following assumed weights.

	Pounds
Rifleman with individual equipment	240
Small-arms ammunition, 1,000 rounds	85
Machinegun, caliber .30	49
Launcher, rocket	13
Launcher, ammunition, 1 round	9

c. Table 4-50 lists the characteristics of rafts. Data include the capacities of rafts in vehicle classification (FM 5-36) for various stream velocities and types of crossings. When two figures are given, the one to the left of the divider (/) pertains to wheeled vehicles and the one to the right pertains to tracked vehicles. Characteristics are based on loading rafts with center of gravity of loads 6 inches downstream from center line of raft and on properly inflated floats. Capacities for M4 and M4T6 bridging are based on roadway width of 18 balk, deck width of 22 balk, and an 18- or 19-foot end span.

d. Table 4-51 lists the characteristics of standard heavy floating bridges.

(1) Load capacities of standard heavy floating bridges in vehicle classification for various stream velocities and types of crossings are shown in *a*, table 51. Characteristics are based on abutment-deck level within 10 inches of floating bridge-deck level except for hinges or other special end spans. When limitations are exceeded, capacities must be reduced. Bridges are reinforced by placing three floating supports under two bays of decking. Capacities for M4 and M4T6 bridging are based on roadway width of 18 balk and deck width of 22 balk. Reinforced assembly requires a 38-foot 4-inch superimposed end span. For class-60 reinforced bridges over streams with flow rates up to 9 feet per second, bridge capacities are controlled by end span limitations. When two figures are given, the one to the left of the divider (/) pertains to wheeled vehicles and the one to the right pertains to tracked vehicles.

(2) Construction times for floating bridges, M4T6 and class 60 are shown in *b*, table 51. All bridges are constructed at prepared sites with no approach work. An overhead cable and bridge-line anchorage are constructed with each bridge. Hours shown are not working hours only, but straight-through hours because this is the normal situation for bridge building. Estimated reinforcement times for 1,000-foot spans are unfeasible because this is normally a battalion-size job. The size of the maintenance crew depends greatly on the weather and stream conditions. The crew shown is the minimum troops for ideal conditions. The figures in the table may appear exceedingly high, but they are based on records of actual experiences. Examination of a time-versus-bridge-length graph will possibly explain some of the incongruities of the figures quoted.

e. Table 4-52 provides the vehicle classification capacities for fixed spans constructed from floating bridge components. In columns 3 through 17, the figure to the left of the divider (/) pertains to wheeled vehicles; the figure to the right pertains to tracked vehicles.

f. Table 4-53 provides load capacity data for fixed highway bridges, based on information in TM 5-312. In columns 2 through 22, the figure to the left of the divider (/) indicates the wheeled load class; the figure to the right indicates the tracked load class.

g. Table 4-54 lists the characteristics of railway bridge equipment and is based on information in TM 5-373.

h. Table 4-55 provides logistic and construction data for military fixed highway bridges, based on information in TM 5-312. In line 5, columns 2 through 8, the figure to the left of the divider (/) indicates the number of 2½-ton dump trucks; the figure to the right indicates the number of 2½-ton utility pole trailers.

Table 4-48. Distribution of River- and Gap-Crossing Equipment

1	2	3	4	5	6	7	8	9
Line item number	Item	Inf div engr bn (TOE 5-155G)		Armd and inf (mech) div engr bn (TOE 5-145G)		Abn div engr bn (TOE 5-25G)	Engr fltbrg co (TOE 5-78G)	Engr pnl brg co (TOE 5-77G)
		MAB	Convl	MAB	Convl			
B83582	Bt, brg erection, inboard eng, aluminum, gas-driven, 27-ft long		8		8		10	
B83856	Bt, ldg, inflatable, aslt cft, nylon-cloth, 15-man	18	18	18	18		70	
B84404	Bt, recon, pneumatic, 3-man	28	28	32	32	11	10	
C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	6	6	6	6			
C22058	Brg erection set, fxd-brg, highway, pony truss, ptbl, pnl-widened roadway, Bailey-type							1
C23017	Brg, fxd, highway, pony truss, ptbl, pnl-widened roadway, Bailey-type							1
C24935	Brg, fltg, ft						1	
C25072	Brg, fltg, highway, aluminum-deck, balk-superstructure		4		4		5	
C25346	Brg, fltg, highway, cl 60, 135-ft		4		4		5	
C25620	Brg, fltg, mbl, aslt, amph, 36-ft 1-in. long, 10-ft wide, 10-ft 4-in. high	16		16				
C25757	Brg, fltg, raft sec, lt, tac	2	2	2	2		6	
C26305	Brg erection set, fltbrg, cl 60, steel- or aluminum-deck, balk-superstructure		4		4		5	
H38787	Ferry conversion set, raft, inf spt	2	2	2	2		6	
L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg, type cl 60	4	4	4	4			
N34334	Outboard mtr, gas 25 bhp	8	8	8	8		24	
R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg, 39-ft 4-in. long by 10-ft wide by 11-ft high	8		8				

Table 4-49. Characteristics of Assault Boats

1	2	3	4	5	6	7
Type of boat	Propulsion	Maximum stream velocity (fps)		Engineer crew	Troop capability	Total load including crew (STON)
		Make headway	Safely navigate			
2 Plastic aslt bt, 16-ft	Paddles	4	3	3	1 rifle sqd with organic wpns.	1. 69
	25-hp outboard	7	5	2	1 rifle sqd with organic wpns.	1. 64
3 Pneumatic aslt bt (15 man)	Paddles	5	4	3	1 rifle sqd with organic wpns.	1. 70
	25-hp outboard	11	9	2	1 rifle sqd with organic wpns.	1. 65

4-30. Field Fortifications

a. Priority of Work. The order in which the various defensive measures are to be performed is expressed as priorities. The assignment of priorities does not prevent simultaneous work on several tasks. After the location of combat emplacements has been fixed, the normal priority is—

(1) Establishing security.

(2) Positioning weapons.

(3) Clearing fields of fire, removing objects, masking observation, and determining ranges to probable target location.

(4) Providing signal communications and observation systems.

(5) Preparing weapon emplacements and individual positions, to include overhead cover, and camouflaging them concurrently.

(6) Laying minefields and preparing important demolitions.

(7) Preparing routes for movement and for supply and evacuation.

(8) Preparing alternate positions.

(9) Preparing obstacles (other than minefields) and less vital demolitions.

(10) Preparing nuclear, biological, and chemical protective shelters as required.

(11) Preparing deceptive installations in accordance with deception plans of higher headquarters.

b. Works. (The figures given in tables 4-56 through 4-59 are for daylight; for work at night, increase labor requirements by 50 percent.)

(1) *Personnel and weapon emplacements.* Table 4-56 lists the characteristics of personnel and individual weapon emplacements. Table 4-57 lists the characteristics of crew-served infantry and artillery weapon emplacements. Data in these tables are taken from FM 5-15.

(2) *Man-hour requirements.* Four man-hours' labor is required for clearing 100 square yards of brush and a few trees up to 12 inches in diameter; for clearing brush only, 2 man-hours are required.

(3) *Barbed wire obstacles.*

(*a*) In estimating material requirements, the minimum length of tactical wire entanglements for a defensive position is one and one-fourth times the frontage; minimum protective wire is five times the frontage. The length of tactical wire entanglements for a deliberate defense is five times the frontage; protective wire is six times the frontage.

(*b*) Table 4-58 lists the requirements for wire entanglement materials and is based on data in FM 5-34.

(*c*) Table 4-59 lists the materials required for constructing 275 meters of expedient concerting wire entanglements.

Table 4-50. Characteristics of Rafts

1	2	3	4	5	6	7	8	9	10	11	12	13
1	Type of raft	Number of pontons or floats	Overall length of raft	Stream velocities for specified crossings (fps)								
				Normal crossings					Risk crossings				
				5 fps	7 fps	8 fps	9 fps	11 fps	5 fps	7 fps	8 fps	9 fps	11 fps
2	Lt tac raft with articulators.	4 pon 3 bay	58 ft	12	12	12	8	0	14	14	14	12	4
		5 pon 5 bay	80 ft	9	9	9	8	3	11	11	11	11	6
		6 pon 4 bay	69 ft	13	13	13	13	6	15	15	15	15	10
3	M4	4 norm	87 ft 1 in	50/55	50/55	50/55	50/55	40/45	55/60	55/60	55/60	55/60	45/50
		6 partially reinf	87 ft 1 in	70/75	70/75	65/70	65/70	50/55	75/80	75/80	75/80	75/80	55/60
		7 fully reinf	87 ft 1 in	85/90	85/90	80/85	80/85	55/60	90/95	90/95	90/95	90/95	65/70
4	C1 60	4 norm	92 ft 5 in	40/45	40/45	35/40	35/40	25/30	50/55	50/55	45/50	45/50	35/40
		5 norm	107 ft 5 in	50/55	50/55	45/50	40/45	30/35	60/65	60/65	55/60	50/55	40/45
		5 partially reinf	92 ft 5 in	55/60	50/55	50/55	45/50	35/40	60/70	60/65	60/55	55/60	45/50
		5 with 1 short deck bay reinf.	83 ft 1 in	60/65	55/60	55/60	50/55	45/50	65/75	65/70	65/70	60/65	55/60
		6 fully reinf	92 ft 5 in	65/75	65/75	60/70	60/65	50/55	80/90	80/90	75/85	70/80	60/70
5	M4T6	4 norm	87 ft	50/55	45/50	40/45	35/40	35/40	60/65	55/60	50/55	45/50	35/40
		4 reinf	86 ft	50/55	50/55	45/50	40/45	35/40	60/65	60/65	55/60	50/55	45/50
		5 norm	101 ft	55/60	50/55	45/50	40/45	35/40	65/70	60/65	55/60	50/55	45/50
		5 reinf	88 ft 9 in	60/65	60/65	55/60	55/56	45/50	70/75	70/75	65/70	65/70	55/56

Table 4–51. Characteristics of Standard Heavy Floating Bridges

a. Load Capacities of Standard Heavy Floating Bridges

1	1	2	3	4	5	6	7	8	10	11	12	12	13	14
	Type of bridge	Type of crossing	Stream velocities for specified assembly (fps)											
			Normal						Reinf					
			3 fps	5 fps	7 fps	8 fps	9 fps	11 fps	3 fps	5 fps	7 fps	8 fps	9 fps	11 fps
2	M4	Norm	60	60	45/50	40/45	30/35	18/20	95	95	75/80	60/65	45/50	24/27
		Caution	68	65	58/59	52/53	44/46	29/31	100	100	88/89	75/76	62	35/37
		Risk	72	68	61/62	58/59	53/54	37/39	195/110	105/110	101/105	88/89	74/75	45/46
3	Cl 60	Norm	60/65	55/65	45/55	40/50	35/45	22/25	65	65	65	65	65	30/35
		Caution	65/70	62/67	56/61	52/56	45/49	34/37	75	75	75	75	75	47/51
		Risk	75/79	72/77	67/72	62/67	57/62	46/50	85	85	85	85	85	70/74
4	M4T6	Norm	50/55	45/55	40/50	35/45	30/40	25/30	75	75	70/75	65/70	55/60	27/30
		Caution	60/61	58/59	54/55	49/51	45/57	35/37	80	80	79	73	66/67	43/45
		Risk	68/69	66/67	62/63	59/60	54/56	43/45	90	90	90	87	81	59/60

b. Construction Times for Standard Heavy Floating Bridges *

1	1	2	3	4	5	6	7	8
	Type of bridge	Type of construction	Approximate construction times (hr)				Construction party	Maintenance crew
			Stream widths					
			150-ft	250-ft	500-ft	1,000-ft		
2	M4T6	Norm	2	3	5	50	1 fltbrg co plus 1 engr cbt co	½ sqd up to 500 ft. 1 sqd more than 500 ft.
		Reinf	3	4½	10	----	1 fltbrg co plus 1 engr cbt co	½ sqd up to 500 ft. 1 sqd more than 500 ft.
3	Cl 60	Norm	2½	3½	5	42	1 fltbrg co plus 1 engr cbt co	½ sqd up to 500 ft. 1 sqd more than 500 ft.
		Reinf	3½	5	10	----	1 fltbrg co plus 1 engr cbt co	½ sqd up to 500 ft. 1 sqd more than 500 ft.

* Does not include time necessary to clear site or do approach work.

Table 4-52. Load Capacities of Fixed Spans Constructed From Floating Bridge Components

a. Class-60 Bridge

1	1 Type of bridge	2 Type of crossing	3	4	5	6	7	8	9	10	11	12	13
			Capacities for specified clear span (ft)										
			24	26	28	30	32	34	36	38	40	50	60
2	Cl 60, fxd-span cap	Norm	100/120	95/120	80/115	65/105	60/95	55/85	50/75	45/65	40/60	30/30	20/22
		Caution	100/120	100/120	87/120	75/110	70/105	63/90	58/81	53/75	50/68	36/36	22/25
		Risk	100/120	100/120	100/120	90/120	85/120	75/110	68/100	65/90	60/83	45/50	28/30

b. M4T6 Bridge

1	1 Type of bridge	2 Type of crossing	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
			Capacities for specified span length and ratio of deck to roadway widths														
			23-ft 4-in. span	30-ft 0-in. span			38-ft 4-in. span					45-ft 0-in. span					
			$\frac{22}{18}$	$\frac{22}{18}$	$\frac{22}{16}$	$\frac{24}{18}$	$\frac{22}{18}$	$\frac{22}{16}$	$\frac{24}{18}$	$\frac{26}{18}$	$\frac{20}{16}$	$\frac{22}{18}$	$\frac{22}{16}$	$\frac{24}{18}$	$\frac{24}{16}$	$\frac{26}{18}$	$\frac{26}{16}$
2	M4T6 balk fxd-span cap.	Norm	100/120	65/85	70/90	70/90	35/45	40/50	45/55	50/65	24/25	24/25	30/30	30/30	35/40	35/40	40/45
		Caution	100/120	80/100	80/100	85/105	51/70	51/70	55/75	50/82	35/40	40/46	40/46	43/51	43/51	46/56	46/56
		Risk	100/120	90/110	90/110	95/115	57/78	57/78	62/85	67/90	40/47	45/54	45/54	49/60	49/60	53/66	53/66

Table 4-53. Load Capacities of Fixed Highway Bridges

1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		Panel bridges																				
		Bailey type, M2																				
		Single-single			Double-single			Triple-single			Double-double			Triple-double			Double-triple			Triple-triple		
		Norm	Caution	Risk	Norm	Caution	Risk	Norm	Caution	Risk	Norm	Caution	Risk	Norm	Caution	Risk	Norm	Caution	Risk	Norm	Caution	Risk
2	30	30/30	42/37	47/42																		
3	40	24/	36/34	40/36																		
4	50	/24	33/31	36/35	75/70	83/86	88/84															

5	60	20/	30/ 29	33/ 32	65/ 65	77/ 73	85/ 79														
6	70	20/	24/	30/ 30	60/ 60	68/ 69	78/ 75														
7	80	16/	20/	24/	50/ 55	60/ 60	66/ 64	85/ 80	95/ 90	100/ 90											
8	90	12/	16/	19/	40/ 45	50/ 50	55/ 55	65/ 65	74/ 75	82/ 82											
9	100	8/	12/	14/	30/ 30	37/ 39	42/ 44	50/ 55	57/ 60	64/ 66	80/ 80	86/ 90	96/ 90								
10	110				20/	30/ 32	34/ 36	35/ 40	47/ 49	52/ 54	65/ 70	72/ 76	80/ 83	90/ 90	100/ 90	100/ 90						
11	120				16/	23/	27/ 30	30/ 35	36/ 41	43/ 45	45/ 55	57/ 61	64/ 68	75/ 80	83/ 90	91/ 90						
12	130				12/	18/	21/	20/	31/ 33	35/ 38	35/ 45	47/ 50	53/ 56	55/ 60	65/ 72	74/ 80	70/ 80	80/ 90	90/ 90			
13	140				8/	14/	17/	16/	24/	29/ 31	30/ 35	39/ 42	44/ 48	45/ 55	57/ 62	64/ 70	70/ 70	80/ 90	88/ 90			
14	150							12/	18/	22/	24/	32/ 35	36/ 40	35/ 45	47/ 51	54/ 58	60/ 60	77/ 85	85/ 90			
15	160							8/	15/	17/	16/	25/	30/ 33	30/ 35	37/ 41	45/ 48	55/ 55	69/ 78	80/ 89	80/ 75	100/ 90	100/ 90
16	170							4/	10/	13/	12/	19/	24/	20/	31/ 34	36/ 40	45/ 50	57/ 64	64/ 74	70/ 70	80/ 90	90/ 90
17	180										8/	15/	18/	16/	24/	29/ 32	35/ 45	48/ 53	55/ 60	55/ 60	66/ 75	77/ 87
18	190													12/	18/	22/	30/ 35	39/ 43	46/ 51	45/ 55	59/ 66	68/ 77
19	200																20/	32/ 36	38/ 43	35/ 40	48/ 52	55/ 62
20	210																16/	25/	31/ 36	24/	38/ 43	46/ 51

Table 4-54. Characteristics of Railway Bridge Equipment

1	2	3	4	5	6	7	8	9	10
	Type of bridge	Bridge sets		Shipping data		Maximum speed at Cooper's E-45 loading (mph)	Construction effort (man-hr)	Erection equipment		Steel trestle units
		Procurement	Theater issue	Weight (STON)	Cubage (MTON)			Special sets	Components	
2	Through truss	123-ft span	92-ft 3-in. span			40	No data aval.	Sp set for spans 92 ft 3 in. to 123 ft.	Lowering frames, erection derrick, misc equip, equip for sp methods.	T-type: piers 2 ft 8 in. in 1-ft 4-in. increments. For brg seatings, see TM 5-374.
			102-ft 6-in. span			40				
			112-ft 6-in. span			40				
			123-ft 0-in. span	133. 66	131. 00	40	7,200			
			133-ft 3-in. span			40	No data aval.	Sp set for spans 133 ft 3 in. to 153 ft 9 in.		
			143-ft 6-in. span			20	9,000			
			153-ft 9-in. span			10	11,294			
		Set A (end posts from sloped to vertical).		1. 68	0. 50					
		Set B—(end posts from square to skew).	Set B	1. 77	1. 34			Sp set consisting of erection frame and erection gantry.		
		Set C—(connect 2 spans with sloped end posts).	Set C	0. 18	0. 14	NA	NA			
		Set D—(connect 2 spans with vertical end posts).	Set D	0. 27	0. 20					
		Set K—(lengthen span to 153 ft 9 in.).	Set K	38. 84	31. 78					

3	Wide-flange beam.	27-in.	22-ft span (2 beams)	No data aval.	6. 10	4. 80	40	100	None.	No data aval.	Various.
			34-ft span (4 beams)		14. 40	12. 30		150			
			40-ft span (6 beams)		19. 00	16. 60		210			
		36-in.	35-ft span (2 beams)		12. 40	10. 50	40	170			
			45-ft span (4 beams)		28. 40	24. 70		470			
			57-ft span (6 beams)		39. 90	35. 00		540			
4	Plate girder, 48-in.		56-ft span (2 girders)	No data aval.	31. 50	24. 10	40	370	None.	No data aval.	Various.
			80-ft span (4 girders)		66. 90	51. 80		660			
			100-ft span (6 girders)		117. 50	88. 60		1,200			

Table 4–55. Logistic and Construction Data for Military Fixed Highway Bridges

1	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Panel bridge, Bailey-type, M2							Beam bridges				Truss and girder bridges	
		Effective length of bay, 10 ft							I-beam stringers		WF-beam stringers		Truss	Girder
	Item	Single truss single story	Double truss single story	Triple truss single story	Double truss double story	Triple truss double story	Double truss triple story	Triple truss triple story	30-ft span	60-ft span	27-in. depth	36-in. depth	90-ft span	48-in. depth
2	Weight per bay (STON)	2. 76	3. 41	4. 01	4. 66	5. 88	6. 46	8. 29	12. 9	35. 3	31. 2	116. 0	49. 9	177. 0
3	Cubage per bay (MTON)	9. 00	11. 00	13. 00	14. 00	18. 00	20. 00	26. 00	15. 5	36. 0	28. 5	105. 0	70. 7	142. 4
4	Type of issue (cl)	II	II	II	II	II	II	II	IV	IV	IV	IV	IV	IV
5	Transportation per bay	3. 40/ 1. 00	2. 20/ 0. 70	2. 60/ 0. 70	3. 00/ 0. 70	3. 80/ 0. 90	3. 70/ 0. 80	5. 50/ 0. 90	No data aval.		No data aval.		No data aval.	
6	Man-hours to erect 1 bay	58. 00	37. 00	49. 00	63. 00	98. 00	171. 00	281. 00	No data aval.		No data aval.		No data aval.	

Table 4-56. Characteristics of Personnel and Individual Weapons Emplacements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		Protection afforded			Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools					Weight and volume of materials							
										Revetment materials for cover support only				Complete revetment			
					Revetment materials for cover support only		Complete revetment			Corrugated metal construction		Sized lumber construction		Corrugated metal construction		Sized lumber construction	
1	Type of emplacement or shelter	Fortification protection factor (NUC WPN)	Thermal effects (NUC WPN)	Tracked vehicles	Artillery fragments	Corrugated metal construction	Sized lumber construction	Corrugated metal construction	Sized lumber construction	No revetment materials used	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)
2	Improved crater	90	Fair	Virtually none.	Better than in open.	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA
3	Skirmishers trench.	95	Fair	Virtually none.	Better than in open.	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA
4	Prone emplacement.	85	Good	Virtually none.	Fair	NA	NA	NA	NA	1.5	NA	NA	NA	NA	NA	NA	NA	NA
5	Open one-man foxhole.	65	Very good.	Good	Good	NA	NA	3.5	4.5	2.0	NA	NA	NA	NA	190	3.5	240	8
6	Open one-man foxhole with offset.	20	Excellent.	Very good.	Excellent	9.0	14	10.0	16.0	NA	50	0.6	180	5.5	240	4.0	420	13
7	One-man foxhole with half cover.	55	Very good.	Fair (—)	Very good	2.5	3	4.5	5.5	NA	10	0.1	20	0.6	200	3.5	260	8
8	One-man foxhole with half cover and offset.	20	Excellent.	Very good.	Excellent	10.0	14	12.0	18.0	NA	60	0.7	200	6.0	250	4.0	440	14

9	Open two-man foxhole.	65	Good	Good	Good	NA	NA	6.0	8.0	3.0	NA	NA	NA	NA	280	5.0	320	10
10	Deepened two-man foxhole.	55	Very good.	Good	Very good	NA	NA	8.0	10.0	5.0	NA	NA	NA	NA	300	5.5	375	12
11	Two-man foxhole with half cover.	60	Very good.	Fair to good.	Very good	4.0	4	8.0	10.0	NA	15	0.2	32	1.0	280	5.0	350	11
12	Two-man foxhole with half cover and two offsets.	15	Excellent	Very good.	Excellent	20.0	30	22.0	35.0	NA	120	1.5	400	12.0	380	6.0	700	22
13	Two-man foxhole with half cover and adjoining shelter.	30	Excellent	Good	Excellent	11.0	17	13.0	22.0	NA	100	1.2	560	18.0	460	7.0	880	28
14	Open fighting trench (25-ft long).	85	Good	Fair	Fair	NA	NA	28.0	32.0	21.0	NA	NA	NA	NA	490	8.0	710	22
15	Fighting trench with full cover (25-ft long).	70	Excellent	Fair	Very good	27.0	29	35.0	40.0	NA	240	4.0	360	11.0	730	12.0	1,060	33

Table 4-57. Characteristics of Crew-Served Infantry and Artillery Weapon Emplacements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Protection afforded				Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools					Weight and volume of materials							
										Revetment materials for cover support only				Complete revetment			
					Revetment materials for cover support only		Complete revetment			Corrugated metal construction		Sized lumber construction		Corrugated metal construction		Sized lumber construction	
1 Type of emplacement or shelter	Fortification protection factor (NUC WPN)	Thermal effects (NUC WPN)	Tracked vehicles	Artillery fragments	Corrugated metal construction	Sized lumber construction	Corrugated metal construction	Sized lumber construction	No revetment materials used	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Volume (cu ft)	Weight (lb)
2 Open horseshoe-type M60 machinegun emplacements.	70	Good	Fair	Fair to good.	NA	NA	5	7	2	NA	NA	NA	NA	280	5	450	14
3 Open 2 one-man foxhold-type light machinegun emplacement.	65	Very good.	Good	Good	NA	NA	6	7	4	NA	NA	NA	NA	530	10	640	20
4 Horseshoe-type machinegun emplacement with full cover.	55	Very good.	Fair	Very good.	9	11	11	14	NA	190	4	250	7	720	13	890	27
5 2 one-man foxhole-type machinegun emplacement with ½ cover and adjoining shelter.	30	Excellent.	Good	Excellent.	15	22	19	28	NA	250	2.5	630	20	520	7.5	850	80
6 Pit-type emplacement for 3.5-in. rocket launcher.	80	Fair	Fair	Fair	NA	NA	5	6	3	NA	NA	NA	NA	110	1.0	160	5
7 81-mm mortar emplacement.	85	Good	Virtually none.	Fair	NA	NA	12	NA	NA	NA	NA	NA	NA	210	3.0	NA	NA
8 4.2-in. mortar emplacement.	85	Good	Virtually none.	Fair	NA	NA	29	NA	NA	NA	NA	NA	NA	370	6.0	NA	NA
9 Recoilless rifle position (mounted).	80	Fair	Virtually none.	Fair	NA	NA	NA	NA	30	NA	NA	NA	NA	NA	NA	NA	NA

Table 4–58. Wire Entanglement Material Requirements

1	1 Material	2 Approximate weight (kg)	3 Approximate length (m)	4 Number carried by one man	5 Approximate weight of man-load (kg)
2	Reel	47. 5	366. 0	½	24. 0
3	Bobbin	3. 5–4. 0	27. 5	4–6	14. 5–24. 5
4	Standard barbed-wire concertina	25. 0	15. 2	1	25. 0
5	Expedient barbed-wire concertina	13. 5	6. 1	1	13. 5
6	Screw pickets, long	4. 0	1. 6	4	16. 3
7	medium	2. 7	0. 81	6	16. 3
8	short	1. 8	0. 53	8	14. 5.
9	extra-long	7. 25	2. 4	3–4	21. 8–29. 0
10	U-shaped pickets, long	4. 5	1. 5	4	18. 1
11	medium	2. 7	0. 81	6	16. 3
12	short	1. 8	0. 61	8	14. 5
13	extra-long	7. 7–10. 5	2. 13	2	15. 4–20. 8
14	Wooden pickets, long	5. 4–7. 25	1. 5	3	16. 3–21. 7
	short	1. 4–2. 7	0. 75	8	11. 0–21. 7

Table 4–59. Material Requirements for Construction of 275 Meters of Expedient Concertina Wire Entanglements

1	1 Type of concertina	2 Standard barbed wire (400-yd reels)	3 Number 10 wire (100-lb coils)	4 Number 16 wire (10-lb coils)
2	Double-belt	23	1	1
3	Triple-belt	34	1	1

4–31. Minefields

a. General. For detailed information on mine warfare, see FM 20–32.

b. Standard Mines. Table 4–60 provides data on standard mines. (See also FM 5–34.)

c. Minefield Estimates. Table 4–61 may be used for initial estimates of material, transportation, and labor requirements to emplace various minefields. The table is based on a standard pattern (three strips for protective, eight for defensive, and nine for barrier minefields). No safety factor for loss or damage to mines and fuzes in transport is included in the data. Normally, there is a 10-percent allowance for such loss.

d. Minefield Clearance. Table 4–62 may be used for initial estimates of time and material requirements for clearing or breaching minefields.

e. Artificial Obstacle Requirements. Table 4–63 may be used for initial estimates of types of material and manpower requirements for artificial obstacles.

Table 4–60. Standard Landmines

1	1 Line item number	2 Type	3 Unit weight (lb)	4 Number per container	5 Gross weight (lb)	6 Cubage (cu ft)
2	M45945	Apers, nm, M14	0. 25	90	44	1. 73
3	M46082	Apers, M16A1	8. 0	4	45	0. 77
4	M46493	Apers, M18A1	2. 5	6	53	1. 84
5	M47863	At, HE, hv, M15	31. 0	1	49	1. 17
6	M48000	At, HE, nm, hv, M19	28. 0	2	71	1. 57
7	M48137	At, HE, hv, M21	18. 75	4	90	4. 14
8	M48822	Cml, 1-gal	11. 0	10	115	2. 0
9	48959	Cml, 2-gal, M23	22. 75	3	115	3. 8

Table 4-61. Manpower, Material, and Transportation Requirements for Emplacement of Minefields

1	Item	2	3	4	5	6	7
		Units per 1,000 meters of minefield			Nuisance mining		
		Protective [a]	Defensive 1-4-8[b]	Barrier 3-4-8[b]	Harassing per kilometer[b]	Facility denial per facility	Route mining per kilometer
2	Antitank mines	500.0	1,632.0	4,564.0	4.0	12.0	30.0
3	Metallic (M15)	(125.0)	([c]1,306.0)	([c]3,651.0)			
4	Nonmetallic (M19)		(326.0)	(913.0)	(1.0)	([b])	([d])
5	Mine, shaped-charge (M21)	(375.0)			(3.0)	(10.0)	(25.0)
	Antipersonnel mines:						
6	Blast (M14 or M25)	1,000.0	12,601.0	12,601.0	15.0	30.0	175.0
7	Fragmentation (M16A1)		6,194.0	6,194.0	25.0	50.0	325.0
8	Directional (M18A1)	1,000.0			5.0	10.0	20.0
9	Firing devices		[e]164.0	[d] 1,460.0	[f] 2.0	[f] 4.0	[f] 10.0
10	Trip flares (M49)	100.0	100.0	100.0			
11	Barbed wire (400-yd reel) [g]		10.6	11.6			
12	Pickets, long		140.0	150.0			
	Manpower [h]:						
13	Man-hours	370.0	2,420.0	3,213.0	8.0	16.0	71.0
14	Platoon hours (30 men)	12.3	80.7	107.1	0.27	0.57	2.37
15	Company-days (3 plat, 10 hr per day)	0.4	2.7	3.6	0.009	0.018	0.08
	Tonnages:						
16	Short tons	10.83	74.27	142.37	0.42	0.87	2.296
17	Measurement tons	16.43	81.44	161.86	0.23	0.53	2.340
	Trucks required:						
18	2½-ton (M35)—4 tons or 407 cu ft	2.7	18.6	35.6	0.1	0.2	0.6
19	5-ton (M54)—6 tons or 513 cu ft	1.8	12.4	23.7	0.07	0.15	0.38
20	5-ton (M51)—7½ tons or 135 cu ft	4.9	24.2	48.0	0.07	0.15	0.7

[a] No irregular outer edge (IOE) in protective field.
[b] IOE cluster composition for defensive and barrier minefields is 1-2-2.
[c] Reduce number of mines in defensive and barrier minefields 50 percent when using M21 mines in place of M15 mines.
[d] 20 percent of M15 and M19 booby trapped with 2 devices.
[e] 5 percent of M15 and M19 booby trapped with 2 devices.
[f] 100 percent of M19 booby trapped with 2 devices. M21 cannot be booby trapped with devices.
[g] 2 sides and rear of minefield only.
[h] Based on laying rate of 4 antitank, 8 antipersonnel fragmentation, or 16 antipersonnel blast mines per man-hour.

Table 4–62. Minefield Clearance (Average Time and Material Requirements)

1	1 Method	2 Width of cleared lane (m (yd))	3 Man-hours required per 91.44 meters (100 yd)	4 Remarks
	Manual			
2	Location by probing	0.914 (1.0) (footpath).	15.0–20.0	See note.
3	Removal by rope or explosives	3.657 (4.0) (vehicle lane).	35.0–40.0	See note.
4	Location by detector, assisted by probing	22.86 (25.0) 3.657 (4.0) (vehicle lane).	200.0–225.0 25.0–30.0.	See note.
	Explosives			
5	Demolition snake, M3A1	2.74–3.65 (3.0–4.0).	0.75	Employment time only. 90–100 hours required for assembly of M3A1.
6	Cable, antipersonnel, M1	0.914 (1.0) (footpath).	3.0–4.0	Cable, antipersonnel, M1, is not effective against antitank mines.
7	Bangalore torpedo	0.914 (1.0) (footpath).	3.0–4.0	See note.

Note. Based on average conditions of visibility and moderate enemy activity and normal U.S. countermeasures, i.e. screening of enemy observation and counterbattery fires against hostile artillery or other weapons covering the field.

4–32. Demolition

a. Explosive requirements for various demolition tasks vary widely, depending on the size of the structure, type of construction, type of materials in the structure, age, location, necessary safety precautions, and other factors.

b. Table 4–64 may be used for initial estimates of material and manpower requirements for the more common types of demolition tasks required in creating obstacles. See also FM 5–25.

c. For classified data, see FM 101–10–3.

4–33. Ford Trafficability

Data in table 4–65 are based on a moderate current (not more than 1.5 meters per second), hard bottom, and hard, dry approaches. Suitable waterproofing may materially increase fording depths of vehicles. For streams of high current velocity, the attitude of the tank to the current and the length of time that the tank is exposed to the current have an appreciable effect on the depth that the tank can ford. Four feet is the design fording depth of modern U.S. tanks. Experience indicates that tanks can ford slightly greater depths for short distances without stalling.

4–34. Load-Bearing Capacity of Ice

The strength of ice varies with the structure of the ice, the purity of the water from which it forms, the cycle of formation (freezing, thawing, and refreezing), temperature, snow cover, and water currents. Tables 4–66 and 4–67 are based on the characteristics of good quality waterborne ice. They may be used as guides until actual load tests are made to determine the load-bearing capacity of the ice.

Table 4-63. Average Requirements for Artificial Obstacles (400 Square Kilometers)

1	Item and unit	2	3	4	5	6	7	8	9	10	11	12	13
		Defensive operations				Retrograde operations				Offensive operations			
		Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement
	Minefields												
2	Barrier (km)	10.3	7.8	2.6	2.6	1.0	0.8	0.5	0.3	0.3	0.2	0.1	0.1
3	Defensive (km)	5.2	4.0	2.5	1.3	0.4	0.3	0.1	0.1	0.2	0.1	0.1	0.1
4	Protective (km)	0.3	0.2	0.1	0.1	0.5	0.4	0.3	0.1	0.5	0.4	0.3	0.1
	Nuisance mining												
5	Harassing (sq km)	70.0	55.0	35.0	20.0	250.0	180.0	150.0	75.0	----			
6	Facility denial (each)	70.0	85.0	100.0	100.0	55.0	65.0	65.0	65.0	7.0	7.0	6.0	6.0
7	Route mining (km)	45.0	35.0	25.0	12.0	115.0	100.0	70.0	45.0	----			
	Obstacles												
8	Highway bridges (each)	40.0	35.0	30.0	15.0	35.0	30.0	20.0	15.0	4.0	4.0	3.0	2.0
9	Railroad bridges (each)	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	----			
10	Tunnels (each)	----			1.0	----			1.0	----			
11	Abatis (each)	7.0	15.0	25.0	30.0	6.0	8.0	12.0	14.0	1.0	1.0	1.0	1.0
12	Road craters (each)	75.0	68.0	68.0	66.0	28.0	28.0	30.0	36.0	1.0	1.0	1.0	2.0
	Barbed-wire entanglements												
13	Double apron 4/2 pace (km)	25.0	25.0	25.0	25.0	2.5	2.5	2.5	2.5	----			
14	4-strand protective (km)	10.0	10.0	10.0	10.0	1.0	1.0	1.0	1.0	----			
15	Triple concertina (km)	6.5	6.5	6.5	6.5	0.5	0.5	0.5	0.5	----			

	Material											
16	Antitank mines (each)	58, 117. 0	44, 478. 0	29, 953. 0	15, 678. 0	10, 577. 0	8, 841. 0	6, 075. 0	4, 012. 0	2, 030. 0	1, 360. 0	842. 0	742. 0
	Antipersonnel mines:												
17	Fragmentation (each)	118, 132. 0	93, 914. 0	63, 469. 0	34, 996. 0	59, 647. 0	51, 013. 0	36, 567. 0	25, 253. 0	4, 017. 0	2, 679. 0	1, 900. 0	1, 700. 0
18	Blast (each)	198, 270. 0	153, 820. 0	100, 874. 0	52, 538. 0	42, 911. 0	37, 024. 0	23, 987. 0	17, 078. 0	6, 741. 0	4, 228. 0	2, 892. 0	2, 692. 0
19	Firing devices, assorted (each)	16, 761. 0	12, 844. 0	8, 722. 0	4, 569. 0	3, 396. 0	2, 837. 0	2, 007. 0	1, 315. 0	499. 0	337. 0	187. 0	187. 0
20	Trip flares	3, 655. 0	3, 275. 0	2, 855. 0	2, 475. 0	400. 0	358. 0	300. 0	258. 0	100. 0	70. 0	30. 0	30. 0
21	Explosives (total) (lb)	99, 000. 0	93, 800. 0	93, 800. 0	88, 600. 0	65, 300. 0	60, 300. 0	54, 500. 0	52, 600. 0	5, 100. 0	5, 100. 0	4, 100. 0	3, 100. 0
22	Barbed wire (400-yd reels)	1, 214. 6	1, 172. 9	1, 126. 8	1, 084. 0	120. 0	110. 0	110. 0	108. 7	5. 6	3. 4	2. 3	2. 3
23	Concertina coils (each)	1, 281. 0	1, 281. 0	1, 281. 0	1, 281. 0	98. 6	98. 6	98. 6	98. 6				
24	Short tons	2, 291. 2	1, 820. 4	1, 324. 8	826. 0	655. 3	559. 7	415. 6	301. 4	72. 5	49. 7	32. 9	30. 0
25	Measurement tons	2, 473. 7	1, 948. 0	1, 383. 2	827. 8	610. 1	519. 3	372. 3	265. 5	79. 6	53. 6	34. 7	30. 8
	Manpower												
26	Platoon-hours (30 men)	1, 981. 1	1, 600. 0	1, 174. 0	753. 5	596. 6	512. 6	382. 6	281. 9	63. 0	43. 0	29. 8	27. 4
27	Battalion-days (10-hr day, 4 co, 3 plat each)	16. 5	13. 3	9. 8	6. 3	5. 0	4. 3	3. 6	2. 3	0. 5	0. 4	0. 3	0. 2

Note 1. Terrain types having following characteristics:

a. Movement

(1) *Easy.* Rolling or level, mostly open, trafficable land. (No one obstacle or combination of obstacles comprises more than 25 percent of the area.)

(2) *Moderate.* Low hills, scattered forest, poorly drained land. (Any one type of obstacle or combination of obstacles comprises 25 to 50 percent of the area.)

(3) *Difficult.* High hills, broken forests, poorly drained land. (Any one type of obstacle or combination of obstacles comprises 50 to 75 percent of the area.)

(4) *Very difficult.* Mountains, forests, marshes. (Any one type of obstacle or combination of obstacles comprises 75 percent of the area.)

b. Obstacles.

(1) Hills and mountains—steep slopes and rough terrain.

(2) Forests—dense woods with trees that are large enough to stop tanks.

(3) Marsh—wet, swampy, untrafficable ground.

Note 2. Does not include tactical wire.

Table 4–64. Material and Manpower Requirements for Individual Barrier Targets

1	1 Target	2 C-4 (lb)	3 TNT (lb)	4 Cratering charge (40-lb)	5 Shaped charge (40-lb)	6 Thermite grenades (each)	7 Squad-hours (10 men)
	Highways						
2	Major bridge (more than 400 ft)		1,200				3.0
3	Minor bridge (up to 400 ft)		800				2.0
4	Tunnel		12,000				5.0
5	Road crater		500	102			12.0
	Railroads						
	Major bridge (more than 400 ft):						
6	Single track		3,000				6.0
7	Double track		4,500				6.0
	Minor bridge (up to 400 ft):						
8	Single track		2,000				4.0
9	Double track		3,000				4.0
10	Tunnel		12,000				5.0
11	Terminal facilities	542	30			43	3.2
12	Rolling stock (locomotive and 30 cars)	6				121	3.2
	Airfields						
13	Runway (per 1,000 ft)		5,500		25		8.0
	Fuel storage (per tk):						
14	Below ground		400			1	1.0
15	Above ground				1	1	0.2
16	Radar/radio apparatus		30			10	0.4
	POL facilities						
17	Storage and handling	4		15		10	1.2
18	Refining facilities	80				15	0.8
19	Distribution	10				2	0.2
	Electric power denial						
20	Generator		150			10	1.0
21	Transformer station		100			25	1.0
	Telecommunications denial						
22	Telegraph exchange	10				1	0.1
23	Telephone exchange	20				2	0.2
24	Repeater/radio station	40				2	0.2
25	Radio station	40					0.2
26	Radio link terminal	40					0.2
	Waterways denial						
27	Lock	110					0.6
28	Weir		1,000				2.0
29	Levee wall, aqueduct, or siphon			15			2.0
30	Dam (navigation)	500					2.5
31	Inland port facilities	20	20				0.4

Table 4-65. Fording Data

1	1 Type of traffic	2 Fordable depth (m (ft))	3 Minimum width (m (ft))	4 Maximum desirable slope for approaches (percentage)
2	Ft	1.0 (3.3)	1.0 (3.3) (single file). 2.0 (6.6) (column of 3's).	100
3	Trks and trkdr arty.	0.6 (2.0)	3.7 (12.0)	33
4	Lt tks	1.0 (3.3)	4.3 (14.0)	50
5	Mdm tks*	1.2 (4.0)	4.3 (14.0)	50

[1] Depths up to 4.3 meters (14.1 ft) can be negotiated with deep-water fording kit.

Table 4-66. Ice Load-Carrying Capacity for Sleds

1	1 Ice thickness (cm (in))	2 Gross sled weight (tons)
2	15.0 (6.0)	1
3	17.5 (7.0)	2
4	23.0 (9.0)	5
5	33.0 (13.0)	10
6	40.0 (16.0)	15
7	46.0 (18.0)	20

Table 4-67. Ice Load-Carrying Capacity for Personnel and Equipment

1	1 Type of load	2 Gross weight (tons)	3 Minimum ice thickness (cm (in))	4 Minimum distance between loads (m (yd))
2	Soldier on skis or snowshoes	0.1	3.0 (1.2)	5.0 (5.5)
3	Soldier on foot	0.1	5.0 (2.0)	5.0 (5.5)
4	Infantry (colm of 2's)		7.6 (3.0)	7.3 (8.0)
5	Infantry (colm of 4's)		10.0 (4.0)	10.0 (11.0)
6	Wheeled-vehicle loads up to	3.5	23.0 (9.0)	15.0 (16.5)
7	Wheeled-vehicle loads up to	6.0	30.0 (12.0)	20.0 (22.0)
8	Wheeled-vehicle loads up to	10.0	40.0 (16.0)	25.6 (28.0)
9	Wheeled-vehicle loads up to	15.0	61.0 (24.0)	30.0 (33.0)
10	Tracked-vehicle loads up to	3.5	20.0 (8.0)	15.0 (16.5)
11	Tracked-vehicle loads up to	10.0	30.0 (12.0)	20.0 (22.0)
12	Tracked-vehicle loads up to	12.5	40.0 (16.0)	25.6 (28.0)
13	Tracked-vehicle loads up to	25.0	61.0 (24.0)	40.0 (44.0)
14	Tracked-vehicle loads up to	45.0	71.0 (28.0)	50.0 (55.0)
15	Tracked-vehicle loads up to	60.0	81.0 (32.0)	60.0 (66.0)

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CHAPTER 5

LOGISTICS—SUPPLY

Section I. GENERAL

5–1. Use of Logistic Data

The logistic data in this and the succeeding four chapters are suitable for first approximation planning. These data are based primarily on World War II and Korean experience, modified to reflect changes in concept and organization. Detailed logistic planning should be based on references listed in the appendix.

5–2. General Supply Factors

a. The broad general factors in table 5–1 are useful for long-range planning when the figures in the remainder of this chapter are too detailed. These factors should be used only in forming rough estimates in logistic planning or as rule of thumb checks against the calculations of technical planners. The overall theater factors include only military requirements and are based on the following ratios between ground and air: for each division slice of approximately 51,955 men there will be two air wing slices of 7,000 each (para 5–23).

b. The figures in table 5–1 do not consider build-up of theater reserves. Initial equipment figures reflect World War II experience; all other figures are based on latest TOE equipment. Figures in parentheses cover bulk petroleum, oil, and lubricant (POL) requirements only.

Table 5–1. Initial Equipment and Initial 30 Days' Maintenance

1	1 Item	2 Total requirements per man in theater (Army+AF)		3 Shipped from CONUS	
		MTON per man	STON per man	MTON per man	STON per man
2	Initial equip	8.00	1.80	8.00	1.80
	30 days' maint:				
3	Dry cargo	0.98	0.68	0.76	0.53
4	Bulk POL	1.39	0.93	1.39	0.93
5	U.S. Army*	(1.08)	(0.72)	(1.08)	(0.72)
6	USAF*	(2.82)	(1.88)	(2.82)	(1.88)
7	Total	10.37	3.41	10.15	3.26

*Figures in lines 5 and 6, columns 2–5, reflect bulk POL required per Army and AF man, respectively, in theater of operations.

Section II. CLASS I SUPPLY

5–3. Characteristics of Standard Rations

Table 5–2 shows the characteristics of standard rations. FM 10–60 contains further details.

5–4. Time Elements in Class I Supply

While the figures in table 5–3 are an approximate average for combat conditions, they should be used as a guide only when actual experience is lacking.

Table 5–2. Characteristics of Standard Rations

1	Item	2 Number of units per case	3 Gross weight per case (lb)	4 Volume per case (cu ft)	5 Average weight per unit including packing (lb)	6 Average calories per unit	7 Remarks
2	Field ration A	[a]	[a]	[a]	6.0	4,600 per ration.	This basic field ration consists of such perishables as fresh and frozen meats, vegetables, and fruit. Its primary use is for stable conditions and static phases of military operations when normal cooking and refrigeration facilities are available. It should be issued in preference to any other type of ration whenever it is available and circumstances permit its use.
3	Standard B ration for Armed Forces.	[b]	[b]	[b]	6.0	4,400 per ration.	Same as the field ration, with nonperishables substituted for perishables. Designed for use where refrigeration facilities are lacking or impracticable but where kitchen and cooking facilities are available. (See SB 10–495.)
4	Meal, combat, individual.	12 meals	25	0.83	1.63	1,200 per meal.	Designed for use as individual meal packets or in multiples of 3 for a complete ration. Not to be used over extended periods.
5	Food packet, Long-range patrol.	24	29	0.87	0.69	1000+ per packet.	Issued to troops under combat conditions where resupply may be uncertain for as long as 10 days. Because the packet is designed for individual use, it is suitable for tactical messing, which requires dispersion. Water, preferably hot, is required to reconstitute the dehydrated components of the packet. Eight different menus are available. This packet has been classified as limited-production type.
6	Food packet, survival, general-purpose.	24 packets.	20	0.43	0.75	880 per packet.	Contains 4 food bars, sugar, instant coffee, and soup and gravy bases packed in a rectangular can with a key opener taped thereto. Minimal recommended issue is ½ packet per man per day in hot climates and 1 packet per man per day in cold climates.
7	Ration, trail, frigid individual.	8 rations	34	1.28	4.0	4,400 per ration.	Designed for use in extremely cold climates by small patrols or trail teams for short periods (1–3 days) when resupply is impossible.
8	Ration supplement, sundries pack (1 pack per 100 men).	1	47	1.75	----------	----------	Composed of items necessary to the health and comfort of troops, e.g., essential toilet articles, tobacco, and confections that normally are obtained at an exchange. Made available in theaters of operations for issue pending establishment of adequate service facilities.
9	Ration supplement, aid station (makes 100 8-oz drinks).	1	16	1.01	----------	----------	Designed for use at forward medical aid stations to provide combat casualties with hot, stimulating beverages, which alleviate shock and contribute to patient comfort.

[a] Warehouse storage space per 100 rations (based on 8-ft stack height and including allowances for aisles) is 22 cu ft refrigerated storage; 45 cu ft covered storage; and 33 cu ft open storage.
[b] Warehouse storage space per 100 rations (based on 8-ft stack height and including allowances for aisles) is 26 cu ft covered storage and 40 cu ft open storage.

Table 5-3. Time Elements in Class I Supply

1	2	3
Work	Daylight (min)	Dark (min)
2 Unloading of rations for 1 division at class I distribution point and preparing to distribute to battalions or units of similar size	120	150
3 Distribution of class I supplies to battalion or unit of similar size by higher echelon at one distribution point	30	30
4 Distribution of class I supplies to separate battalion or unit of similar size by higher echelon	15	15
5 Preparation of 1 day's class I supplies for issue at battalion class I distribution point	30	60
6 Physical distribution by battalion of 1 day's class I supplies (transfer of loads) to kitchen	15	20

Teble 5-3. Time Elements in Class I Supply—Continued

1	2	3
Work	Daylight (min)	Dark (min)
7 Unloading of kitchen equipment from trucks, setting up, and being prepared to begin cooking (or vice versa)	20	20
8 Breakdown of subsistence into 3 meals at kitchen (breakdown accomplished by mess personnel)	15	20
9 Personnel to prepare, cook, and be ready to serve a hot meal, starting with a hot kitchen	120	150
10 Kitchens to prepare a cold noon meal	60	90
11 Serving a hot meal to troops from a kitchen truck with majority of men being served at the truck	45	60
12 Serving a hot meal to troops by carrying parties (when kitchen is located within a 900-meter radius of company)		

Section III. CLASS II AND IV SUPPLY

5-5. General

Tables 5-4 through 5-9 include items of class II and IV supply. The list of equipment and materials is representative rather than all-inclusive.

5-6. Items of Class II and IV Supply—Dimensions and Weights

a. Tables 5-4 through 5-7 list by commodity command selected items of equipment included in latest published TOE. Dimensions and weights are from SB 700-20 and FM 101-20. For communications-electronics equipment refer to FM 24-19.

(1) Dimensions in columns 3, 4 and 5 are the maximum length, width, and height in feet of fully assembled equipment in travel position.

(2) Weights of noncombat and half-tracked vehicles in column 8 are for unloaded vehicles. Weights of other combat vehicles are fighting (loaded) weights.

(3) Measurement tons (MTON) (colm 9) represent the volume of the fully assembled item i.e., the product of columns 3, 4, and 5 in cubic feet divided by 40.

(4) For classified data, see FM 101-10-3, chapter 5.

b. Table 5-8 shows the composition, weights, and measures of major medical equipment sets and the supporting equipment for each set.

c. Table 5-9 shows the weights in MTON and short tons (STON) of common construction and fortification materials.

Table 5-4. Items of Equipment, Mobility Equipment Command

1	1	2	3	4	5	6	7	8	9
	Line item number	Item	Dimensions (ft)			Sq ft	Cu ft	STON	MTON
			Length	Width	Height				
2	A26647	Air conditioner, tlr-mtd, gas-driven, 26,500 BTU	8. 16	5. 83	6. 16	47. 5	293. 0	1. 17	7. 3
3	A30071	Airplane, obsn, O-1A	25. 75	36. 0	9. 2			0. 76	
4	A30221	Airplane, obsn, STOL, OV-1B	43. 96	48. 0	12. 66			5. 49	
5	A30271	Airplane, obsn, STOL, OV-1C	41. 11	42. 0	12. 66			5. 0	
6	A30621	Airplane, util, U-1A	41. 84	58. 0	12. 58			2. 41	
7	A30671	Airplane, util, U-6A	30. 41	48. 0	10. 41			1. 65	
8	A30821	Airplane, util, U-8F	33. 33	45. 8	14. 17			2. 61	
9	A30971	Airplane, util, STOL, U-10A	30. 29	39. 0	8. 83			1. 13	
10	A36901	Altimeter, surv, 4,500 m	1. 3	1. 3	1. 0	1. 7	1. 7	0. 008	0. 04
11	B01756	Auger, earth, skid-mtd, gas-driven, 9-ft bore depth	16. 5	4. 0	4. 0	66. 0	264. 0	3. 6	6. 6
12	B18647	Bkry plant, tlr-mtd, M1945	16. 53	8. 12	8. 36	134. 0	1, 122. 0	5. 51	28. 1
13	B31197	Barge, deck or liq cgo, nonpropelled	120. 0	33. 0	18. 0	3, 960. 0	71, 280. 0	196. 0	1, 782. 0
14	B43662	Bath unit, ptbl, GED, 8-shower	6. 5	4. 08	3. 33	27. 0	88. 0	0. 63	2. 2
15	B83445	Bt, brg erection, inboard eng, aluminum, gas-driven, 19-ft long.					1, 349. 0	4. 43	34. 0
16	B83582	Bt, brg erection, inboard eng, aluminum, gas-driven, 27-ft long.					1, 813. 0	6. 15	45. 3
17	B83856	Bt, ldg, inflatable, aslt craft, nylon-cloth, 15-man	6. 5	2. 63	1. 35	17. 0	23. 0	0. 18	0. 6
18	B83993	Bt, pax and cgo	65. 5	17. 67	21. 0	1, 158. 0	24, 318. 0	74. 0	608. 0
19	B84130	Bt, picket, 36- to 47-ft	46. 33	12. 42	13. 0	568. 0	7, 384. 0	11. 0	184. 6
20	B84267	Bt, picket, 52- to 65-ft	65. 0	16. 0	16. 0	1, 032. 0	16, 512. 0	34. 7	412. 8
21	B84404	Bt, recon, pneumatic, 3-man	22. 0	2. 2	1. 0	5. 0	5. 0	0. 01	0. 1
22	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long.					2, 316. 0	15. 35	57. 9
23	C22058	Brg, erection set, fxd-brg, highway, pony truss, ptbl, pnl-widened roadway, Bailey-type.					716. 0	11. 05	17. 9
24	C22880	Brg, fxd, highway, aluminum, 38-ft long					1, 050. 0	10. 75	26. 3
25	C23017	Brg, fxd, highway, pony truss, ptbl, pnl-widened roadway, Bailey-type.					2, 861. 0	116. 7	71. 5
26	C24935	Brg, fltg, ft	12. 75	27. 7	7. 16	353. 0	2, 531. 0	9. 7	63. 3
27	C25072	Brg, fltg, highway, aluminum-deck, balk-superstructure					1, 875. 0	21. 0	46. 7
28	C25346	Brg, fltg, highway, cl 60, 135-ft					130. 0	97. 0	3. 3
29	C25620	Brg, fltg, mbl, aslt, amph, 36-ft 1-in. long, 10-ft wide, 10-ft 4-in. high.	36. 1	10. 0	10. 3	361. 0	3, 730. 0	26. 6	93. 3
30	C25757	Brg, fltg, raft sec, lt, tac	18. 0	5. 0	5. 08	90. 0	450. 0	10. 6	11. 3
31	C26305	Brg erection set, flt brg, cl 60, steel- or aluminum-deck, balk-superstructure.	5. 83	4. 25	3. 25	24. 8	80. 5	1. 5	2. 0
32	C29490	Bucket, clamshell, ¾-cu. yd	6. 5	3. 33	9. 0	22. 0	194. 0	2. 13	4. 9
33	C30997	Bucket, dragline, ¾-cu yd	5. 58	3. 87	3. 95	22. 0	85. 0	0. 93	2. 1

34	E02670	Chassis, tlr, GP, 3½-ton, 2-wheel with equip	15.63	8.0	4.0	125.0	500.0	1.3	12.5
35	E02807	Chassis, tlr, genr, 2½-ton, 2-wheel with equip	13.5	7.75	3.5	105.0	366.0	1.07	9.2
36	E67735	Compressor, reciprocating, power-driven base, AC, 115-v, 60-cy, 1-ph, 2.7 cfm, 80 psi.	1.75	0.95	1.37	1.3	2.3	0.037	0.06
37	E68694	Compressor, reciprocating, air, power-driven, AC, 208–416 v, 60-cy, 3-ph, 15 cfm, 175 psi.					72.3	0.53	1.8
38	E68968	Compressor, reciprocating, air, power-driven, AC, 208–416 v, 60-cy, 3-ph, 25 cfm, 175 psi.					90.56	0.73	2.3
39	E69105	Compressor, reciprocating, power-driven, air, gas-driven, 5 cfm, 175 psi.					20.7	0.23	0.5
40	E69242	Compressor, reciprocating, power-driven, air, gas-driven, 15 cfm, 175 psi.					56.3	0.5	1.4
41	E69790	Compressor, reciprocating, power-driven, air, skid-mtd, gas-driven, 55 cfm, 100 psi.	8.41	4.87	4.33	41.0	177.0	1.34	4.4
42	E70749	Compressor, reciprocating, power-driven, air, wheel-mtd, AC, 208–416-v, 60-cy, 3-ph, 15 cfm, 3,500 psi.	6.0	4.91	3.91	30.0	120.0	0.54	3.0
43	E70886	Compressor, reciprocating, power-driven, air, gas-driven, wheel-mtd, 15 cfm, 3,500 psi.	7.58	5.75	3.5	43.5	152.0	1.1	3.8
44	E71160	Compressor, reciprocating, power-driven, air, 4-wheel, pneumatic tires, gas-driven, 15 cfm, 3,500 psi.	11.96	5.69	6.21	68.0	423.0	1.1	10.6
45	E71434	Compressor, reciprocating, power-driven, air, trk, gas-driven, winterized, 80 cfm, 5,000 psi.	23.0	7.75	7.33	178.0	1,300.0	9.3	32.5
46	E72398	Compressor, rot, power-driven, air, skid-mtd, gas-driven, 125 cfm, 100 psi.	7.5	3.5	4.0	26.2	105.0	1.5	2.6
47	E73352	Compressor, rot, power-driven, air, wheel-mtd, diesel-driven, 600 cfm, 100 psi.	13.16	6.33	7.25	83.0	603.0	4.8	15.1
48	E73626	Compressor, rot, power-driven, air, gas-driven, 60 cfm, 6.5 psi.					21.9	0.1	0.5
49	F00355	Conversion-stor-chg unit, CO_2, stlr-mtd, 16,000-lb, gas-driven.	29.12	8.16	10.33	237.0	2,450.0	11.8	61.3
50	F35953	Crane, barge, 60-ton	153.0	58.0	77.0	8,874.0	683,221.0	848.0	17,081.0
51	F36090	Crane, barge, 89- to 250-ton	140.0	70.0	86.66	9,800.0	850,000.0	1,575.0	21,250.0
52	F38693	Crane, trac, towed, 20-ton, 20-ft lift	27.13	9.21	6.0	250.0	1,499.0	5.65	37.5
53	F39104	Crane, trk, whs, gas, pneumatic tires, 10,000-lb	13.08	8.0	6.42	105.0	672.0	10.35	16.8
54	F39241	Crane, wheel-mtd, 5-ton, ⅜-cu yd, diesel, 4X4, rough terrain, air-trans.					2,400.0	14.3	60.0
55	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	28.5	11.5	12.25	328.0	4,015.0	30.5	100.4
56	F39515	Crane-shovel, basic unit, crawler-mtd, 10-ton, ¾-cu yd	14.58	8.58	10.52	125.0	1,310.0	16.7	32.8
57	F40474	Crane-shovel, basic unit, crawler-mtd, 40-ton, 2-cu yd	21.0	11.91	11.41	250.0	2,857.0	66.1	71.2
58	F43077	Crane-shovel, wheel-mtd, 7-ton, ½-cu yd, gas, with 24-ft boom crane, 9-ton block and tackle.					1,100.0	8.5	27.5
59	F43414	Crane-shovel, trk-mtd, 20-ton, ¾-cu yd, with 20-ton block and tackle, 30-ft boom crane.	28.37	8.75	12.66	248.0	3,143.0	28.25	78.2
60	F50995	Crusher, jaw, gas-driven, wheel-mtd, 15-ton-per-hr	13.5	6.0	7.0	81.0	567.0	4.2	14.2
61	G02341	Detecting set, mine, ptbl, metallic	2.18	1.39	0.66	3.0	2.0	0.02	0.005

Table 5-4. Items of Equipment, Mobility Equipment Command—Continued

1	1	2	3	4	5	6	7	8	9
	Line item number	Item	Dimensions (ft)			Sq ft	Cu ft	STON	MTON
			Length	Width	Height				
62	G27664	Distr, bituminous mat, tk-type, gas-driven, trk-mtd, 800-gal.	25. 66	8. 08	9. 33	207. 0	1, 930. 0	11. 7	48. 3
63	G27938	Distr, liq bituminous mat, tankless-type, gas, tlr-mtd, 375 gpm.	9. 0	7. 08	7. 0	63. 7	446. 0	2. 27	11. 1
64	G28212	Distr, water, tk-type, gas, trk-mtd, 1,000-gal	24. 08	8. 16	9. 0	196. 0	1, 764. 0	10. 4	44. 1
65	G29945	Ditching mach, diesel-driven, wheel-mtd	28. 25	8. 0	12. 45	228. 0	2, 840. 0	18. 1	71. 0
66	G35089	Dolly, tlr, convt, 6-ton, 2-wheel, with equip	9. 0	7. 66	4. 25	69. 0	293. 0	1. 5	7. 3
67	G35226	Dolly, tlr, convt, 8-ton, 2-wheel, with equip	9. 58	8. 0	4. 33	77. 0	333. 0	1. 8	8. 3
68	G35363	Dolly, tlr, convt, 18-ton, 4-wheel, with equip	2. 5	9. 58	4. 66	120. 0	558. 0	4. 0	13. 9
69	G44069	Drafting equip set, topo bn pmop co	17. 5	10. 75	12. 33	188. 0	2, 320. 0	14. 9	58. 0
70	H38787	Ferry conversion set, raft, inf spt	4. 66	3. 08	3. 91	14. 3	560. 0	0. 7	14. 0
71	H56391	Fftg equip set, trk-mtd, Army acft crash, os, cl 530B					1, 760. 0	10. 5	44. 0
72	H56528	Fftg equip set, trk-mtd, brush, os, cl 530B					1, 237. 0	6. 6	30. 9
73	H56802	Fftg equip set, trk-mtd, struc-type, os, cl 530B					1, 886. 0	11. 35	47. 0
74	J30766	Genr and chg plant, acetylene, stlr-mtd, 750 cfh	33. 41	8. 41	11. 41	281. 0	3, 200. 0	15. 6	8. 0
75	J30903	Genr and chg plant, CO_2, stlr-mtd, 300-lb-per-hr	35. 25	9. 35	11. 75	329. 0	3, 700. 0	24. 5	92. 3
76	J31451	Genr and chg plant, oxy-nitrogen, stlr-mtd, elec-driven					3, 110. 0	28. 7	77. 8
77	J35561	Genr set, diesel-eng, tlr-mtd, PU-407/M	14. 25	8. 0	7. 25	114. 0	826. 0	3. 75	20. 5
78	J35698	Genr set, diesel-eng, trk-mtd, PU-408/M	25. 83	8. 0	9. 67	207. 0	2, 000. 0	13. 8	50. 0
79	J35835	Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, AC, 120—208/240—416-v, skid-mtd	8. 0	3. 25	5. 58	26. 0	145. 0	1. 8	3. 6
80	J36109	Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, AC, 120—208/240—416-v, 50-cy, skid mtd	10. 0	3. 91	7. 66	39. 0	299. 0	3. 0	7. 5
81	J36931	Genr set, diesel-eng, 45-kw, 60-cy, 3-ph, AC, 120—208/240—416-v, 50-cy, ptbl power	10. 41	3. 75	5. 91	39. 0	227. 0	2. 2	5. 7
82	J37753	Genr set, diesel-eng, 60-kw, 60-cy, 3-ph, AC, 120—208/240—416-v, 50-cy, skid-mtd	11. 16	3. 91	7. 25	44. 0	317. 0	3. 5	7. 9
83	J38712	Genr set, diesel-eng, 100-kw, 60-cy, 3-ph, AC, 120—208/240—416-v, 50-cy, skid-mtd	11. 0	5. 08	7. 5	56. 0	419. 0	3. 63	10. 5
84	J40767	Genr set, gas-eng, tlr-mtd, PU-236/G					654. 0	1. 79	16. 4
85	J40904	Genr set, gas-eng, tlr-mtd, PU-248/U	13. 88	7. 92	7. 08	110. 0	780. 0	1. 95	19. 5
86	J41041	Genr set, gas-eng, tlr-mtd, PU-253/U	14. 0	7. 0	6. 75	98. 0	661. 0	2. 78	16. 5
87	J41178	Genr set, gas-eng, tlr-mtd, PU-290/MR	13. 83	6. 92	7. 0	97. 0	670. 0	2. 15	16. 8
88	J41315	Genr set, gas-eng, tlr-mtd, PU-294/G	13. 83	6. 92	7. 0	97. 0	670. 0	2. 5	16. 8
89	J41589	Genr set, gas-eng, tlr-mtd, PU-322/C	12. 25	6. 13	6. 92	75. 0	520. 0	1. 32	13. 0
90	J42274	Genr set, gas-eng, 0.15-kw, 60-cy, 1-ph, AC, 120-v, skid-mtd	1. 5	1. 1	1. 54	1. 7	2. 5	0. 02	0. 06
91	J42959	Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, AC, 120-v, shock-mtd	2. 72	1. 83	1. 91	5. 0	9. 5	0. 05	0. 24

92	J43233	Genr set, gas-eng, 0.5-kw, 2-wire, DC, 28-v, shock-mtd					4. 6	0. 06	0. 01
93	J43918	Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, AC, 120-v, shock-mtd	3. 06	2. 04	2. 1	6. 2	13. 0	0. 17	0. 33
94	J44055	Genr set, gas-eng, 1.5-kw, DC, 28-v, shock-mtd	3. 21	2. 13	2. 33	6. 8	15. 9	0. 15	0. 4
95	J45699	Genr set, gas-eng, 3-kw, 60-cy, 1–3-ph, 120–240/120–208-v, skid-shock-mtd.	3. 67	2. 5	3. 33	9. 2	30. 6	0. 18	0. 76
96	J45836	Genr set, gas-eng, 3-kw, 400-cy, AC, 1–3-ph, 120–240/120–208-v, skid-shock-mtd.	3. 27	2. 6	2. 93	5. 9	17. 0	0. 27	0. 43
97	J46110	Genr set, gas-eng, 3-kw, DC, 28-v, skid-shock-mtd	3. 67	2. 5	3. 33	9. 0	30. 0	0. 16	0. 75
98	J47068	Genr set, gas-eng, 5-kw, 60-cy, 1–3-ph, AC, 120–240/120–208-v, skid-shock-mtd.	3. 33	2. 83	3. 16	9. 4	29. 9	0. 29	0. 75
99	J48713	Genr set, gas-eng, 5-kw, 400-cy, 1–3-ph, AC, 120–240/120–208-v, skid-shock-mtd.	6. 0	2. 4	2. 2	14. 0	32. 0	0. 5	0. 8
100	J49398	Genr set, gas-eng, 10-kw, 60-cy, 1–3-ph, AC, 120–240/120–208-v, skid-mtd.	6. 29	3. 27	4. 63	20. 5	95. 0	0. 9	2. 4
101	J74715	Grader, rd, motorized, diesel-driven, air-trans, 6x4	22. 0	6. 75	7. 08	149. 0	1, 050. 0	7. 5	26. 3
102	J74852	Grader, rd, motorized, diesel-driven, hv, 6x4, front-wheel steering.	26. 37	8. 0	7. 58	212. 0	1, 600. 0	12. 6	40. 0
103	K24520	Heater, bitumen, gas-driven, tlr-mtd, 3-car heating	13. 75	5. 58	5. 83	77. 0	448. 0	2. 6	11. 2
104	K25342	Heater, immersion, liq-fuel-fired, 30-in. long					5. 7	0. 03	0. 14
105	K30254	Hel, cgo, trans, CH–34C	65. 83	56. 0	15. 9			3. 83	
106	K30378	Hel, cgo, trans, CH–47A	98. 25	51. 17	18. 54			9. 04	
107	K30645	Hel, obsn, OH–6A	30. 3	26. 33	8. 5			0. 58	
108	K30682	Hel, obsn, OH–13E	41. 4	8. 56	9. 5			0. 81	
109	K30746	Hel, obsn, OH–13S	43. 2	8. 56	9. 46			0. 99	
110	K30917	Hel, obsn, OH–23D	40. 7	10. 0	10. 13			0. 88	
111	K31749	Hel, util, UH–1B	52. 75	9. 3	14. 7			2. 28	
112	K31786	Hel, util, UH–1D	57. 08	9. 33	14. 68			2. 35	
113	K90188	Inst rep shop, trk-mtd, 2½-ton, 6x6, with equip	21. 79	8. 0	10. 74	174. 0	1, 870. 0	8. 4	46. 8
114	L21300	Kettle, heating, bitumen, gas-driven, skid-mtd, 750-gal	13. 0	6. 91	4. 5	90. 0	405. 0	2. 7	10. 1
115	L36739	LCM, 69-ft	73. 67	12. 67	13. 67	933. 0	12, 760. 0	11. 0	319. 0
116	L36876	LCU, 115-ft	115. 0	34. 0	19. 0	3, 900. 0	74, 290. 0	201. 6	1, 857. 5
117	L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg, type cl 60.	36. 25	13. 16	13. 25	477. 0	6, 321. 0	45. 56	258. 0
118	L48315	Ldry unit, tlr-mtd, 30-lb cap, drying tumbler	16. 66	8. 0	8. 0	136. 0	1, 088. 0	4. 65	27. 2
119	L57425	Life preserver, fld army	0. 83	0. 5	0. 25	0. 4	0. 1	0. 002	0. 003
120	L63720	Lt set, gen illumination					12. 5	0. 92	3. 1
121	L63994	Lt set, gen illumination, 25-outlet	4. 54	3. 56	2. 56	16. 2	41. 7	0. 5	1. 04
122	L63857	Lt set, gen illumination, 15-kw	9. 5	4. 0	4. 13	38. 0	157. 0	1. 5	3. 9
123	L64131	Lt set, marker, emerg, afld runway, ptbl, btry-op	2. 16	1. 14	1. 68	2. 5	4. 0	0. 02	0. 1
124	L64542	Lt set, op area, acft, ½-kw, heliport	6. 0	4. 1	3. 5	24. 0	87. 0	0. 5	2. 2
125	L67234	Lighter, amph, SP, 2 ½- to 5-ton	35. 0	10. 17	10. 0	350. 0	3, 556. 0	10. 5	88. 9
126	L67371	Lighter, amph, SP, 15-ton	45. 0	12. 5	12. 92	563. 0	7, 280. 0	17. 5	182. 0
127	L67508	Lighter, amph, SP, diesel, stlr, 60-ton, 61-ft	62. 56	26. 58	19. 43	1, 658. 0	32, 300. 0		807. 5

Table 5-4. Items of Equipment, Mobility Equipment Command—Continued

1	1	2	3	4	5	6	7	8	9
	Line item number	Item	Dimensions (ft)			Sq ft	Cu ft	STON	MTON
			Length	Width	Height				
128	L76351	Loader, scoop-type, diesel-driven, 4-wheel, 1½-cu yd	18. 16	7. 08	6. 72	128. 0	863. 0	7. 7	21. 6
129	L76625	Loader, scoop-type, diesel, 4-wheel, 2½-cu yd, with multi-segment bucket	21. 41	8. 45	7. 52	181. 0	1, 357. 0	13. 9	33. 9
130	L79947	Loco, diesel, 36- to 42-in. gage, 44-ton, fgn svc	37. 0	10. 75	8. 08	398. 0	3, 220. 0	44. 0	80. 5
131	L80084	Loco, diesel, 36- to 42-in. gage, 58- to 76-ton, fgn svc	41. 22	11. 21	8. 5	462. 0	3, 930. 0	76. 0	98. 3
132	L80632	Loco, diesel, 56½-in. gage, 44- to 80-ton, dom and fgn svc	35. 0	9. 5	13. 25	332. 0	4, 400. 0	71. 0	110. 0
133	L80769	Loco, diesel, 56 ½- to 66-in. gage, 120- to 131-ton, dom and fgn svc	56. 83	9. 58	13. 25	545. 0	7, 200. 0	120. 0	180. 0
134	L85146	Lub-svc unit, power-op, tlr-mdt, 15 cfm, air compressor, gas-driven	15. 16	7. 75	9. 0	118. 0	1, 057. 0	2. 88	26. 4
135	L85283	Lub-svc unit, power-op, tlr-mtd, 15 cfm, air compressor, gas-driven	14. 61	7. 96	6. 63	116. 0	771. 0	2. 86	19. 6
136	M07614	Map distr set, dep					5, 340. 0	3, 670. 0	133. 5
137	M07751	Map distr set, ptbl	13. 33	4. 0	5. 0	53. 0	265. 0	2. 2	6. 6
138	M53877	Mixer, bituminous mat, nonself-loading, diesel, tlr-mtd	20. 98	9. 96	1. 67	209. 0	2, 440. 0	15. 7	61. 0
139	M54151	Mixer, concrete, tlr-mtd, gas-driven, 16-cu ft	10. 0	8. 0	10. 5	80. 0	840. 0	2. 95	21. 0
140	N34334	Outboard mtr, gas, 25 bhp	5. 6	2. 33	2. 75	13. 0	36. 0	0. 22	0. 9
141	N87460	Pmap sec, topo mapping set, trk-mtd	27. 0	8. 08	10. 88	218. 0	2, 374. 0	10. 8	59. 4
142	P11866	Pneumatic tool and compressor outfit, 250 cfm, tlr-mtd	18. 08	8. 08	6. 75	146. 0	988. 0	1. 4	24. 7
143	P96640	Pumping assy, flammable liq, bulk trf	4. 05	3. 17	2. 79	13. 0	36. 0	0. 32	0. 9
144	Q98454	Ry car, box, 36- to 42-in. gage, 30-ton, fgn svc	34. 46	7. 06	6. 96	243. 0	1, 690. 0	15. 0	42. 3
145	Q98728	Ry car, box, 56½-in. gage, 40- to 50-ton, dom svc	40. 5	9. 13	10. 5	372. 0	3, 890. 0	23. 0	97. 3
146	Q99276	Ry car, flat, 36- to 42-in. gage, 30-ton, fgn svc	37. 1	7. 92	3. 66	294. 0	1, 075. 0	10. 5	26. 9
147	R00235	Ry car, flat, 56½- to 66-in. gage, 80- to 90-ton, fgn svc	46. 67	7. 72	3. 67	360. 0	1, 323. 0	35. 0	33. 1
148	R00372	Ry car, flat, depressed cen, 56½- to 66-in. gage, 70-ton, fgn svc	51. 0	9. 67	4. 58	498. 0	2, 290. 0	41. 6	57. 3
149	R00509	Ry car, gondola, high-side, 36- to 42-in. gage, 30-ton, fgn svc	37. 16	7. 92	7. 66	294. 0	2, 255. 0	13. 3	56. 4
150	R00646	Ry car, gondola, high-side, 56½-in. gage, 30- to 50-ton, dom svc	42. 33	9. 99	8. 63	425. 0	3, 660. 0	2. 5	91. 5
151	R00920	Ry car, gondola, low-side, 36- to 42-in. gage, 30-ton, fgn svc	37. 16	7. 92	5. 08	294. 0	1, 495. 0	12. 1	37. 4
152	R01194	Ry car, gondola, low-side, 56½- to 66-in. gage, 40-ton, fgn svc	40. 75	9. 5	5. 63	387. 0	2, 180. 0	16. 0	54. 5
153	R01742	Ry car, ki-dining amb tn, fgn svc	66. 16	9. 5	13. 0	628. 0	8, 160. 0	54. 7	204. 0
154	R02016	Ry car, med pers, amb tn, fgn svc	66. 17	9. 5	13. 0	628. 0	8, 150. 0	54. 2	203. 8
155	R03112	Ry car, tk, petrl, 36- to 42-in. gage, fgn svc	40. 0	8. 0	5. 08	320. 0	3, 520. 0	16. 0	88. 0
156	R05304	Ry car, ward, amb tn, fgn svc	66. 16	9. 5	13. 0	628. 0	8, 150. 0	55. 2	203. 8

157	R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg, 39 ft 4 in. by 10 ft by 11 ft	39. 33	10. 0	11. 66	393. 0	4, 570. 0	27. 0	114. 3
158	R84963	Repro set, topo, photolitho, repro	26. 66	8. 16	9. 83	217. 0	2, 130. 0	11. 7	53. 3
159	S11068	Roller, motorized, gas-driven, tandem, 2 rollers, 5- to 8-ton	14. 5	5. 41	6. 25	79. 0	490. 0	6. 1	12. 3
160	S11205	Roller, motorized, gas-driven, tandem, 3 rollers, 9- to 14-ton	22. 16	5. 5	7. 41	122. 0	902. 0	6. 3	22. 0
161	S11479	Roller, motorized, gas-driven, 10-ton, 3-wheel, with scarifier and sprinkler	19. 0	6. 58	7. 25	125. 0	.906. 0	10. 9	22. 6
162	S12438	Roller, towed, pneumatic-tired, 4 tires, 7½-ton, ballast to 50-ton	24. 75	8. 0	7. 62	198. 0	1, 506. 0	7. 0	37. 7
163	S12164	Roller, towed, pneumatic-tired, 13 tires, 9-ton	10. 33	6. 83	3. 91	71. 0	276. 0	1. 93	6. 9
164	S12575	Roller, towed, sheepsfoot, 2 drums	13. 25	9. 83	4. 5	130. 0	585. 0	3. 0	14. 6
165	S35741	Saw, chain, gas-driven, 18-in	3. 0	2. 0	1. 0	6. 0	6. 0	0. 02	
166	S56804	Scraper, earthmoving, towed, 18-cu yd	35. 0	10. 33	10. 45	360. 0	3, 770. 0	19. 8	94. 3
167	S66736	Slt, DC, 28-v, 100-a, 22 15/16-in. reflector	2. 92	2. 92	2. 17	8. 0	18. 0	0. 16	0. 45
168	S67147	Slt set, carbon-arc, 60-in.-diam reflector, DC, 78-v, trk-mtd					1, 946. 0	951. 0	48. 6
169	S70243	Stlr, low-bed, wkr, 12-ton, 4-wheel, 40-ft, with equip	49. 16	8. 0	5. 0	393. 0	1, 965. 0	7. 0	49. 1
170	S70517	Stlr, low-bed, 25-ton, 4-wheel, with equip	34. 25	9. 58	5. 25	329. 0	1, 720. 0	8. 0	43. 0
171	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip	33. 83	12. 0	7. 08	406. 0	2, 875. 0	16. 4	71. 9
172	S71065	Stlr, maint, wpn elec unit, 6-ton, 2-wheel, with equip	22. 83	7. 91	11. 0	180. 0	1, 985. 0	3. 66	49. 6
173	S71887	Stlr, stake, 6-ton, 2-wheel, with equip	22. 91	8. 0	11. 0	183. 0	2, 010. 0	3. 6	50. 3
174	S72024	Stlr, stake, 12-ton, 4-wheel, with equip	28. 66	8. 08	9. 0	231. 0	2, 090. 0	6. 8	52. 3
175	S72846	Stlr, tk, fuel, 5,000-gal, 12-ton, 4-wheel, with equip	31. 11	8. 06	8. 97	250. 0	2, 240. 0	6. 7	56. 0
176	S72983	Stlr, tk, fuel-svc, 5,000-gal, 12-ton, 4-wheel, with equip	31. 11	8. 06	8. 97	250. 0	2, 240. 0	6. 9	56. 0
177	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	38. 5	12. 16	8. 75	468. 0	4, 100. 0	21. 2	102. 5
178	S73531	Stlr, van, cgo, 6-ton, 2-wheel, with equip	22. 91	7. 75	8. 58	177. 0	1, 520. 0	3. 6	38. 0
179	S74079	Stlr, van, cgo, 12-ton, 4-wheel, with equip	29. 16	8. 08	7. 66	235. 0	1, 807. 0	7. 75	45. 2
180	S74353	Stlr, van, elct, 3- to 6-ton, 2-wheel, 30-ft body, with equip	27. 0	8. 0	10. 91	206. 0	2, 357. 0	5. 5	56. 3
181	S74216	Stlr, van, elct, 3- to 6-ton, 26-ft body, with equip	27. 08	11. 08	8. 0	300. 0	2, 400. 0	4. 36	60. 0
182	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip	26. 91	8. 16	11. 16	219. 0	2, 450. 0	7. 5	61. 3
183	S74832	Stlr, van, rep parts stor, 6-ton, 4-wheel, with equip					2, 295. 0	8. 6	57. 4
184	S75038	Stlr, van, shop, 6-ton, 2-wheel, with equip	22. 91	7. 83	11. 33	179. 0	2, 030. 0	3. 8	50. 8
185	S75175	Stlr, van, sup, 12-ton, 2-wheel, with equip	28. 69	8. 08	11. 61	232. 0	2, 700. 0	8. 0	67. 5
186	T1Q138	Shop equip, contact maint, trk-mtd	17. 83	7. 25	7. 04	129. 0	910. 0	4. 5	22. 5
187	T10275	Shop equip, elec rep, stlr-mtd	26. 75	8. 0	10. 66	224. 0	2, 380. 0	10. 1	59. 5
188	T10412	Shop equip, elct rep, stlr-mtd	26. 75	8. 0	10. 66	214. 0	2, 280. 0	10. 2	57. 0
189	T10549	Shop equip, GP rep, stlr-mtd	26. 5	8. 08	9. 5	214. 0	2, 030. 0	11. 5	50. 8
190	T13152	Shop equip, org rep, lt, trk-mtd	28. 04	7. 79	9. 89	218. 0	2, 155. 0	12. 1	54. 0
191	T18221	Shop set, acft maint, fxd base, gnd hdlg and svc, set A					1, 330. 0	525. 0	33. 3
192	T21235	Shop set, acft maint, stlr-mtd, A–1, toolcrib, elec flaw detection	27. 32	8. 11	11. 25	222. 0	2, 493. 0	10. 64	62. 3
193	T21372	Shop set, acft maint, stlr-mtd, A–2, sheet-metal welding, hyd	27. 32	8. 11	11. 25	222. 0	2, 493. 0	10. 95	62. 3
194	V09730	Tagline, crane and crane-shovel, ¾- to 1-cu yd bucket	5. 14	3. 12	2. 85	16. 0	46. 0	0. 29	1. 2
195	V12141	Tk and pump unit, liq-dispensing, trk-mtd	9. 1	6. 5	10. 83	59. 0	640 0	1. 24	16. 0

Table 5-4. Items of Equipment, Mobility Equipment Command—Continued

1	1 Line item number	2 Item	3 Dimensions (ft) Length	4 Width	5 Height	6 Sq ft	7 Cu ft	8 STON	9 MTON
196	V19950	Tk unit, liq-dispensing, tlr-mtd	5. 12	6. 04	4. 67	31. 0	144. 0	0. 21	3. 6
197	W06379	Tex rep shop, tlr-mtd	13. 42	5. 58	5. 38	75. 0	403. 0	2. 2	10. 1
198	W07701	Theodolite, surv, dir, 0.002-mil	4. 0	1. 66	2. 0	7. 0	14. 0	0. 007	0. 3
199	W07838	Theodolite, surv, dir, 0.2-mil	1. 22	1. 22	1. 58	2. 0	3. 0	0. 02	0. 1
200	W72172	Tower erection set, topo	11. 83	7. 5	6. 33	89. 0	563. 0	5. 5	14. 8
201	W76816	Trac, full-tracked, low-spd, diesel, hv DBP, with bulldozer, with scarifier winch	19. 63	11. 21	7. 83	220. 0	1, 724. 0	24. 4	43. 1
202	W77638	Trac, full-tracked, low-spd, diesel, hv DBP, with bulldozer, with scarifier winch	19. 58	7. 75	9. 25	152. 0	1, 403. 0	27. 7	35. 8
203	W94030	Tlr, ammo, 1½-ton, 2-wheel, with equip	12. 33	8. 16	2. 58	100. 0	260. 0	1. 18	6. 5
204	W94441	Tlr, basic util, 2½-ton, 2 single wheels, with equip	16. 58	8. 16	3. 66	135. 0	495. 0	1. 85	12. 4
205	W94578	Tlr, bolster, pole-hauling 3½-ton, 2-wheel, with equip	22. 58	7. 0	3. 5	158. 0	553. 0	1. 21	13. 8
206	W94715	Tlr, bolster, swivel bolster, aja stanchions, 2½-ton, with equip	16. 58	8. 16	3. 66	135. 0	495. 0	1. 15	12. 4
207	W95263	Tlr, cable, reel, 3½-ton, 2-wheel, with equip	12. 42	8. 0	5. 73	100. 0	570. 0	1. 58	14. 3
208	W95400	Tlr, cgo, ¼-ton, 2-wheel, with equip	9. 04	5. 05	3. 56	45. 0	160. 0	0. 29	4. 0
209	W95537	Tlr, cgo, ¾-ton, 2-wheel, with equip	12. 25	6. 13	4. 17	75. 0	313. 0	0. 67	7. 8
210	W95811	Tlr, cgo, 1½-ton, 2-wheel, with equip	13. 83	6. 91	4. 58	95. 0	438. 0	1. 33	10. 9
211	W96359	Tlr, fftg, pump, water, 1,500 gpm, elec, DC, 24-v, 12-hp. 2,000-gal	19. 08	8. 33	8. 25	159. 0	1, 312. 0	4. 85	23. 8
212	W96907	Tlr, flat-bed, 10-ton, 4-wheel, with equip	28. 0	8. 16	4. 66	229. 0	1, 063. 0	5. 65	26. 6
213	W97455	Tlr, low-bed, 8-ton, 4 dual wheels, with equip	19. 5	8. 5	4. 75	166. 0	786. 0	4. 8	19. 6
214	W97592	Tlr, low-bed, 60-ton, 4 dual front wheels, 8 dual rear wheels, with equip	41. 08	11. 5	6. 41	472. 0	3, 030. 0	15. 6	75. 8
215	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-wheel, with equip	13. 08	6. 66	6. 08	87. 0	530. 0	1. 3	13. 3
216	X38639	Trk; amb, ¼-ton, 4x4, with equip	12. 91	5. 08	6. 66	66. 0	437. 0	1. 5	10. 9
217	X38776	Trk, amb, ¾-ton, 4x4, with equip	17. 17	7. 83	6. 67	134. 0	895. 0	3. 4	22. 4
218	X39050	Trk, bolster, 2½-ton, 6x6, WWN, with equip	22. 91	8. 0	8. 25	183. 0	1, 510. 0	6. 6	37. 8
219	X39187	Trk, bolster, 5-ton, 6x6, WWN, with equip						9. 49	
220	X39735	Trk, cgo, ¾-ton, 4x4, with equip	15. 5	6. 33	6. 0	98. 0	588. 0	2. 7	14. 7
221	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip	15. 92	6. 33	6. 0	101. 0	605. 0	2. 8	15. 1
222	X40009	Trk, cgo, 2½-ton, 6x6, with equip	21. 92	8. 0	6. 64	175. 0	1, 160. 0	6. 7	29. 0
223	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip	23. 04	8. 0	6. 64	184. 0	1, 220. 0	6. 9	30. 5
224	X40283	Trk, cgo, 2½-ton, 6x6 extra LWB, with equip	27. 41	8. 0	6. 75	219. 0	1, 480. 0	7. 4	37. 0
225	X40420	Trk, cgo, 2½-ton, 6x6, extra LWB, WWN, with equip	28. 54	8. 0	6. 75	228. 0	1, 540. 0	7. 6	38. 8
226	X40831	Trk, cgo, 5-ton, 6x6, LWB, with equip	24. 81	8. 13	7. 1	201. 0	1, 425. 0	9. 5	35. 6
227	X40968	Trk, cgo, 5-ton, 6x6, LWB, WWN, with equip	26. 04	8. 13	7. 1	212. 0	1, 500. 0	9. 95	37. 5
228	X41790	Trk, cgo, 10-ton, 6x6, WWN, with equip	27. 58	10. 91	9. 25	300. 0	2, 780. 0	15. 8	69. 5
229	X43297	Trk, dump, 2½-ton, 6x6, with equip	21. 68	8. 0	6. 83	173. 0	1, 180. 0	7. 9	29. 5

230	X43434	Trk, dump, 2½-ton, 6x6, WWN, with equip	22. 77	8. 0	6. 83	182. 0	1, 245. 0	8. 1	31. 1
231	X43708	Trk, dump, 5-ton, 6x6, with equip	22. 2	8. 17	9. 21	181. 0	1, 670. 0	10. 7	41. 8
232	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip	23. 46	8. 17	9. 21	191. 0	1, 760. 0	11. 1	44. 0
233	X44804	Trk, fftg, pump, foam and water, 500 gpm	22. 67	7. 67	8. 21	173. 0	1, 426. 0	7. 45	35. 7
234	X48914	Trk, lift, fork, diesel-driven, 6,000-lb cap	22. 42	8. 5	10. 25	191. 0	1, 953. 0	11. 48	48. 8
235	X51654	Trk, lift, fork, gas, 4,000-lb, 180-in. long	7. 17	3. 83	7. 17	27. 0	197. 0	3. 9	4. 9
236	X51791	Trk, lift, fork, gas, pneumatic tires, 6,000-lb	9. 71	5. 63	9. 5	55. 0	520. 0	5. 4	13. 0
237	X51928	Trk, lift, fork, gas, pneumatic tires, 6,000-lb, rough terrain	15. 13	7. 17	7. 5	108. 0	812. 0	13. 5	20. 3
238	X52476	Trk, lift, fork, gas, pneumatic tires, 10,000-lb, rough terrain.	16. 94	8. 58	8. 33	145. 0	1, 210. 0	15. 27	30. 3
239	X53983	Trk, maint, earth-borer, pole-setter, 2½-ton, 6x6, WWN, with equip.	27. 5	7. 33	8. 91	202. 0	1, 796. 0	8. 57	44. 9
240	X55627	Trk, platform, util, ½-ton, 4x4, with equip	9. 83	4. 16	4. 08	40. 9	167. 0	0. 48	4. 18
241	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip	31. 33	9. 66	9. 5	302. 0	2, 870. 0	13. 3	71. 8
242	X57271	Trk, tk, fuel-svc, 2½-ton, 6x6, with equip	21. 91	8. 0	7. 33	175. 0	1, 285. 0	6. 8	32. 1
243	X57408	Trk, tk, fuel-svc, 2½-ton, 6x6, WWN, with equip	22. 91	8. 0	7. 33	183. 0	1, 340. 0	6. 9	33. 5
244	X58093	Trk, tk, fuel-svc, 2,500-gal, 4x4, with equip						14. 1	
245	X58367	Trk, tk, water, 1,000-gal, 2½-ton, 6x6, with equip	21. 91	7. 91	7. 44	173. 0	1, 287. 0	7. 9	32. 2
246	X59052	Trk, trac, 2½-ton, 6x6, with equip	19. 0	7. 8	6. 7	148. 0	1, 000. 0	5. 8	25. 0
247	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip	20. 17	7. 8	6. 71	157. 0	1, 050. 0	6. 1	26. 3
248	X59326	Trk, trac, 5-ton, 6x6, with equip	21. 44	8. 15	7. 14	175. 0	1, 250. 0	8. 6	31. 3
249	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip	22. 83	8. 15	7. 14	186. 0	1, 330. 0	9. 1	33. 3
250	X59600	Trk, trac, 10-ton, 6x6, with dual midship winch, with high-mtd 5th wheel, with equip.	23. 33	9. 5	9. 41	221. 0	2, 080. 0	14. 5	52. 0
251	X59874	Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th wheel, with equip.	24. 0	9. 0	8. 29	216. 0	1, 790. 0	16. 0	44. 8
252	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip	29. 35	8. 15	7. 26	239. 0	1, 855. 0	16. 4	46. 4
253	X60833	Trk, util, ¼-ton, 4x4, with equip	11. 0	5. 16	5. 91	57. 0	335. 0	1. 05	8. 4
254	X61244	Trk, util, ¼-ton, 4x4, carr for 106-mm rifle, with equip	11. 58	5. 08	6. 08	59. 0	358. 0	1. 47	8. 9
255	X61929	Trk, van, expansible, 2½-ton, 6x6, with equip	28. 17	8. 0	6. 67	225. 0	1, 500. 0	4. 41	37. 5
256	X62237	Trk, van, expansible, 5-ton, 6x6, with equip						12. 74	
257	X62340	Trk, van, shop, 2½-ton, 6x6, with equip	21. 79	8. 0	10. 74	174. 0	1, 870. 0	7. 9	46. 8
258	X62477	Trk, van, shop, 2½-ton, 6x6, WWN, with equip	22. 92	8. 0	10. 74	183. 0	1, 970. 0	8. 1	49. 3
259	X63025	Trk, wkr, crane, 2½-ton, 6x6, WWN, with equip	25. 17	8. 0	7. 75	201. 0	1, 550. 0	9. 9	48. 8
260	X63162	Trk, wkr, 2½-ton, 6x6, WWN, with equip	25. 19	8. 0	8. 42	201. 0	1, 690. 0	12. 36	42. 3
261	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip	29. 13	8. 17	9. 46	238. 0	2, 250. 0	16. 9	56. 3
262	X63436	Trk, wkr, 10-ton, 4x4, with equip						19. 42	
263	X70772	Tug, 200- to 400-hp	45. 16	12. 5	15. 0	565. 0	8, 475. 0	28. 2	211. 9
264	X70909	Tug, 600- to 650-hp	70. 0	20. 0	30. 0	1, 400. 0	42, 000. 0	103. 0	1, 050. 0
265	X71046	Tug, 1,200- to 1,530-hp	107. 0	26. 5	37. 0	2, 840. 0	105, 000. 0	330. 0	2, 625. 0
266	Y00176	Ves, liq-cgo	183. 0	30. 0	38. 0	5, 490. 0	208, 800. 0	533. 0	5, 220. 0
267	Y35212	Water purification equip set, tlr-mtd, diatomite filter, 600 gpm.	14. 6	8. 1	6. 8	118. 0	804. 0	2. 78	20. 1
268	Y35486	Water purification equip set, trk-mtd, diatomite filter, 1,500 gpm.					2, 205. 0	11. 1	55. 2
269	Y42371	Wpn sight, infrared	2. 5	1. 08	0. 41	3. 0	1. 1	0. 01	0. 03
270	Y48255	Welding shop, cgo, tlr-mtd, 300 amp	13. 83	6. 92	8. 17	96. 0	782. 0	2. 9	19. 6

Table 5-5. Items of Equipment, Weapons Command

1	1	2	3	4	5	6	7	8	9
	Line item number	Item	Dimensions (ft)			Sq ft	Cu ft	STON	MTON
			Length	Width	Height				
2	A90117	Armt subsys, hel, 7.62-mm mg, door-mtd, M23	2. 85	1. 06	0. 82	3. 0	2. 4	0. 03	0. 06
3	A90460	Armt subsys, hel, 40-mm GL, M5					51. 0	0. 19	1. 3
4	A91324	ARAAV, M551	20. 66	9. 17	8. 42	189. 0	1, 590. 0	16. 3	39. 8
5	C36100	Bulldozer, earthmoving, tk mounting for M48-series tks	13. 25	6. 50	3. 34	86. 0	287. 0	4. 39	7. 2
6	C36120	Bulldozer, earthmoving, tk mounting for M60-series tks	12. 17	5. 5	3. 0	67. 0	201. 0	5. 0	5. 0
7	D10725	Carr, 81-mm mort, full-tracked	18. 41	10. 7	9. 33	197. 0	1, 840. 0	21. 55	46. 0
8	D10740	Carr, 107-mm mort, SP	18. 41	10. 7	9. 33	197. 0	1, 840. 0	21. 55	46. 0
9	D10990	Carr, cgo, amph, tracked	15. 1	7. 1	5. 84	107. 0	625. 0	3. 35	15. 6
10	D11048	Carr, cgo, tracked, 6-ton, M548						8. 0	----------
11	D11401	Carr, comd and recon, armd	14. 65	7. 65	6. 45	112. 0	724. 0	6. 9	18. 1
12	D10990	Carr, CP, lt, tracked	15. 98	8. 82	8. 86	141. 0	1, 245. 0	3. 35	31. 1
13	D12086	Carr, pers, full-tracked, armd	16. 0	8. 83	7. 16	141. 0	1, 010. 0	9. 87	25. 3
14	E56577	CEV full-tracked	26. 0	12. 17	10. 88	316. 0	3, 440. 0	53. 0	86. 0
15	J96694	Gun, antiaircraft arty, SP, 20-mm	15. 96	8. 81	8. 81	----------	----------	13. 00	----------
16	J96845	Gun, antiaircraft arty, Towed 20-mm	13. 00	6. 33	6. 83	----------	----------	1. 50	----------
17	J96819	Gun, antiaircraft arty, SP, 40-mm	20. 34	10. 75	9. 34	218. 0	2, 040. 0	22. 2	51. 0
18	J96956	Gun, at SP, 90-mm	19. 17	14. 96	8. 46	287. 0	2, 430. 0	6. 4	60. 8
19	J97230	Gun, FA, SP, 175-mm	37. 2	10. 5	9. 3	391. 0	3, 640. 0	26. 35	91. 0
20	J97367	Gun, rcl, 120-mm	5. 5	2. 0	3. 39	11. 0	37. 0	0. 21	0. 9
21	K56981	How, hv, SP, 8-in	22. 1	10. 5	9. 3	232. 0	2, 160. 0	26. 8	54. 0
22	K57118	How, hv, towed, 8-in	36. 0	8. 45	8. 85	304. 0	2, 700. 0	16. 0	62. 8
23	K57255	How, lt, SP, 105-mm	20. 02	10. 81	9. 16	217. 0	1, 985. 0	22. 7	49. 6
24	K57392	How, lt, towed, 105-mm					800. 0	1. 6	20. 0
25	K57529	How, towed, 105-mm	19. 7	7. 4	5. 8	146. 0	845. 0	2. 49	21. 1

26	K57666	How, mdm, SP, 155-mm	20.02	10.81	9.16	217.0	1,985.0	24.7	49.6
27	K57803	How, mdm, towed, 155-mm	24.6	8.05	7.65	198.0	1,515.0	6.35	37.8
28	L37013	Ldg veh, tracked, comd	29.0	11.71	10.04	340.0	3,415.0	32.1	85.4
29	L37030	Ldg veh, tracked, engr	39.77	12.71	10.71	505.0	5,400.0	41.38	135.0
30	L37118	LVTP	29.67	11.71	8.63	348.0	3,000.0	34.89	75.0
31	L37132	Ldg veh, tracked, recov	31.75	11.71	10.75	372.0	4,000.0	37.5	100.0
32	L44575	Lchr, gren, 40-mm	2.58	0.62	0.38	1.6	0.6	0.005	0.02
33	L44580	Lchr, gren, 40-mm, for XM16E1 rifle	0.8					0.001	
34	L91975	Mg, cal .50, hv, flex	5.75	0.75	0.85	4.3	3.6	0.06	0.01
35	L92386	Mg, 7.62-mm, lt, flex	2.85	1.06	0.82	3.0	2.4	0.03	0.06
36	M68008	Mort, 81-mm, on mount	4.58	1.5	1.25	7.0	9.0	0.01	0.23
37	M68282	Mort, 4.2-in, on mount	6.01	6.0	1.25	36.0	45.6	0.45	1.14
38	R50543	Recov veh, full-tracked, lt, armd	21.78	10.5	9.7	229.0	2,220.0	23.8	55.5
39	R50680	Recov veh, full-tracked, mdm	27.24	11.51	9.92	313.0	3,100.0	54.4	77.5
40	R91244	Revolver, cal .38, 4-in. bbl	0.45	0.17	0.79			0.005	
41	R94977	Rifle, 5.56-mm, with bipod	3.25					0.003	
42	R95114	Rifle, 7.62-mm	3.96	0.94	0.33	3.7	1.23	0.016	
43	R95251	Rifle, 7.62-mm, auto, with bipod	3.96	0.94	0.33	3.7	1.23	0.016	
44	R96484	Rifle, rcl, 90-mm	4.88	1.58	1.56	7.7	12.0	0.05	0.3
45	R96758	Rifle, rcl, 106-mm, on mount	11.75	4.83	3.25	57.0	185.0	0.46	4.6
46	U56346	Smg, cal .45	1.2	0.69	0.31	0.83	0.25	0.005	
47	V12826	Tk, cbt, full-tracked, 76-mm gun	23.07	10.5	10.1	242.0	2,450.0	21.3	61.3
48	V12963	Tk, cbt, full-tracked, 90-mm gun	24.4	11.92	9.94	291.0	2,890.0	53.0	71.3
49	V13100	Tk, cbt, full-tracked, 105-mm gun	26.67	11.92	10.33	317.0	3,270.0	63.5	81.8
50	V13237	Tk, cbt, full-tracked, 120-mm gun	33.36	11.92	10.58	398.0	4,200.0	49.95	105.0
51	V13374	Tk, cbt, full-tracked, flamethrower	22.59	11.8	10.7	266.0	2,860.0	27.5	71.5
52	W76679	Trac, full-tracked, high-spd, 32-ton	22.1	10.87	9.2	241.0	2,220.0	27.5	55.5

Table 5-6. Items of Equipment, Missile Command

1	1	2	3	4	5	6	7	8	9
	Line item number	Item	Dimensons (ft)			Sq ft	Cu ft	STON	MTON
			Length	Width	Height				
2	A80891	Ant-rcvt-xmtr gp, acq, with equip (HERC)::	15. 5	6. 33	7. 66	98	753	1. 17	18. 8
3	D11675	Carr, GM equip, with equip (PERSH)						5. 95	
4	G14458	Dir sta, GM, tlr-mtd, with equip (HERC)	21. 8	8. 07	10. 66	176	1, 880	6. 96	47. 0
5	H01957	Elct shop, tlr-mtd, with equip (HERC)	26. 25	8. 0	10. 58	210	2, 220	4. 9	55. 5
6	H14889	Erector-lchr, GM trans, with equip (PERSH)	20. 2	6. 83	7. 91	138	1, 090	2. 96	27. 3
7	J93997	Guidance and launching sta, with equip (Entac)	4. 31	4. 0	2. 92	17	39	0. 14	1. 0
8	K12718	Hdlg unit, rkt, tlr-mtd, 762-mm, with equip (HJ)	28. 0	8. 1	11. 1	227	2, 520	4. 9	63. 1
9	K12855	Hdlg unit, rkt, trk-mtd, 318-mm with equip (LJ)						6. 75	
10	K27486	Heating and tiedown unit, 762-mm rkt, trk-mtd, with equip (HJ)	32. 5	8. 2	9. 63	267	2, 570	13. 28	64. 2
11	L44712	Lchr, monorail, GM, with equip (HERC)	23. 66	8. 41	3. 75	199	745	7. 5	18. 6
12	L45397	Lchr, rkt, 318-mm, with equip (LJ)	18. 08	5. 17	4. 09	94	386	0. 66	9. 7
13	L45534	Lchr, rkt, 762-mm, trk-mtd, with equip (HJ)	32. 41	9. 5	8. 75	308	2, 695	17. 13	67. 4
14	L45671	Lchr, rkt, 762-mm, with equip (HJ)	28. 83	6. 92	5. 08	200	1, 015	2. 19	25. 4
15	L46445	Launching con gp, GM, tlr-mtd, with equip (HERC)	23. 92	8. 08	10. 33	193	2, 000	5. 2	50. 0
16	L46856	Launching sta, GM stlr-mtd, 4-wheel (SGT)	31. 33	7. 83	7. 79	245	1, 910	8. 35	47. 8
17	L76762	Loader trans, GM, with equip (HAWK)	14. 83	6. 25	7. 58	93	705	2. 25	17. 6
18	Q18017	Rdr set, pulse acq, tlr-mtd, with equip (HAWK)	16. 41	8. 16	10. 83	134	1, 450	4. 77	36. 2
19	V60764	Test equip, elct shop, fld maint, tlr-mtd, shop 1 (HERC)	26. 7	8. 0	10. 5	214	2, 250	6. 5	56. 2
20	V60901	Test equip, elct shop, fld maint, tlr-mtd, shop 2 (HERC)	26. 4	8. 0	10. 5	211	2, 220	6. 66	55. 5
21	W00906	Test sta, GM sys comp, fld maint (PERSH)	15. 6	6. 95	6. 98	109	762	3. 58	19. 0
22	W01043	Test sta, GM sys comp, fld maint (SGT)	31. 5	8. 2	9. 6	259	2, 490	7. 75	62. 2
23	W01180	Test sta, GM sys comp, org maint (SGT)	31. 5	8. 2	9. 6	259	2, 490	7. 75	62. 2
24	W74994	Tracking sta, GM, tlr-mtd, with equip (HERC)	21. 41	7. 91	10. 66	170	1, 810	6. 45	45. 3
25	W98551	Tlr, rkt trans, 762-mm, with equip (HJ)	25. 1	8. 0	6. 5	201	1, 310	2. 5	32. 7
26	W99236	Tlr, van, launching con, 4-wheel, with equip (HERC)						3. 4	
27	W99373	Tlr, van, rdr sig simulator, with equip (HERC)						3. 53	
28	X45489	Trk, GM, body sec, with equip (HERC)	8. 25	3. 5	1. 5	29	44	0. 26	1. 1
29	X45626	Trk, GM, nose sec, with equip (HERC)	5. 17	3. 48	3. 51	18	63	0. 2	1. 6
30	X45900	Trk, GM, rkt mtr, with equip (HERC)	12. 83	6. 25	3. 25	81	261	1. 1	6. 5
31	X46037	Trk, GM, test set, with equip (HERC)	8. 58	4. 41	1. 66	38	62	0. 41	1. 5

Table 5-7. Items of Chemical Equipment, Munitions Command

1	1	2	3	4	5	6	7	8	9	10
	Line item number	Item	Dimensions (ft)			Sq ft	Cu ft	STON	MTON	Remarks
			Length	Width	Height					
2	C19503	Breathing appar, compressed air	2.5	1.1	0.65	2.8	1.8	0.016	0.05	
3	C19640	Breathing appar, oxy genr	0.65	1.5	1.83	1.0	1.8	0.021	0.05	
4	E74037	Compressor, reciprocating, power-driven, PFT, 2½ cfm.	2.44	1.81	2.25	4.6	13.6	0.083	0.25	
5	F81469	Decon appar, ptbl, 1½-qt	2.0	1.58	0.92	3.2	2.8	0.031	0.07	Packed 12 items per box.
6	F81880	Decon appar, power-driven, skid-mtd, multipurpose, nonintegral, 500-gal, M12A1.					290.5	1.8		
7	F82154	Decon appar, power-driven, trk-mtd, 400-gal, M9	21.75	7.25	8.75	158.0	1,379.3	8.4	34.5	
8	G04300	Detector kit, cml agt	1.68	1.5	0.91	2.52	2.3	0.025	0.06	Packed 8 items per box.
9	G04437	Detector kit, cml agt, VGH	1.68	1.5	0.92	2.52	2.3	0.024	0.06	Packed 30 items per box.
10	G22109	Disperser, riot con agt, hel- or veh-mtd	7.25	1.5	2.5	10.9	27.2	0.13	0.68	
11	G22246	Disperser, riot con agt, ptbl	2.82	1.83	1.2	5.2	6.2	0.048	0.16	
12	H50418	Filter unit, gas-particulate, hosp, 6-man, 12 cfm	3.25	1.21	1.19	3.9	4.7	0.069	0.12	
13	H50555	Filter unit, gas-particulate, tk, 5-man, 20 cfm M13A1					4.0	0.05		Comp of M60 tk.
14	H50829	Filter unit, gas-particulate, tk, 4-man, 12 cfm, ABC, M8A3.					1.8	0.026		Comp of M48A2 mdm tk.
15	H68063	Flamethrower, ptbl	2.08	2.21	1.17	4.6	5.38	0.032	0.14	
16	H68200	Flamethrower, mech, main armt, APC-mtd	10.42	5.33	7.0	55.6	390.0	2.65	9.75	Comp of M132 SP flamethrower.
17	H68337	Flamethrower, mech, main armt, trl-mtd, M7A1-6					220.0	12.0		Comp of M48A2 mdm tk.
18	J30492	Genr, smoke, mech, pulse-jet	4.25	1.96	2.38	8.3	19.8	0.12	0.5	
19	L96030	Maint rep krt, CBR equip, M14					6.0	0.1	0.26	
20	M12032	Mask, CBR, protective, tk	1.72	2.0	1.42	3.4	4.8	0.046	0.12	
21	S78771	Svc kit, ptbl flamethrower, riot con agt disperser	2.83	1.92	1.58	5.4	8.6	0.058	0.22	
22	S79045	Svc unit, flamethrower, trk-mtd	21.91	7.75	10.26	170.0	1,743.0	8.25	43.6	
23	Y15711	Vulcanizer, hot-patch, protective mask, face, blank	2.0	1.58	0.92	3.2	2.9	0.028	0.07	

Table 5–8. Army Medical Service Unit Assemblages

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		Med equip set(s)						Other commodity comd						Total unit TOE assemblage					
Line item number	Major med equip set	Number of lines	Number of packages	STON	Cubage	Car-loads	Sq ft of stor space	Number of lines	Number of packages	STON	Cubage	Car-loads	Sq ft of stor space	Total number of lines	Total number of packages	Total STON	Total cubage	Total car-loads	Total sq ft of Stor space
M22738	Conv cen, army, 1,500-pnt.	970	814	30.7	4,636	2	450	495	4,400	260.0	31,400	13	4,000	1,140	3,520	292.1	35,863	15	4,450
M22875	Conv cen, army, expansion, 1,500-pnt.	507	481	19.3	3,290	1	265	170	2,706	138.2	12,612	6	1,500	1,002	4,881	159.6	15,216	7	1,765
M23012	Med lab, army, ptbl.	3,132	852	18.1	2,450	1	365	----	----	----	----	----	----	----	----	----	----	----	----
M23149	Med lab, army, smbl.	1,848	249	2.8	10	1	144	----	----	----	----	----	----	----	----	----	----	----	----
M24519	Disp, COMMZ	388	65	2.21	310	LCL	35	----	----	----	----	----	----	----	----	----	----	----	----
M25067	Evac hosp, 400-bed, smbl.	2,631	975	31.75	3,896	13	665	249	1,052	72.2	8,221	3	1,040	2,880	2,027	114.0	14,823	16	1,705
M25204	Fld hosp, hospitalization unit, mbl.	902	472	15.6	2,100	1	253	----	----	----	----	----	----	----	----	----	----	----	----
M25752	Gen disp, COMMZ, type 1.	656	98	1.69	148	LCL	56	233	51	2.0	218	LCL	27	889	149	6.6	783	LCL	83
M25889	Gen disp, COMMZ, type 2.	596	170	3.23	289	LCL	85	84	45	2.0	90	LCL	11	680	215	8.6	942	LCL	96
M26163	GH, 1,000-bed, COMMZ.	2,887	3,709	108.7	.....	15	3,440	335	2,105	125.0	13,638	6	1,800	3,222	5,814	358.9	47,761	21	5,240

12	M26300	Sta hosp, 100-bed, COMMZ.	1,882	478	25.85	3,620	2	450	388	397	22.8	3,023	1	320	2,220	875	55.0	7,440	3	770
13	M26300	Sta hosp, 200-bed, COMMZ.	1,950	790	39.85	5,760	3	760	235	810	25.9	3,328	1	400	2,185	1,600	72.5	9,729	4	1,160
14	M26437	Sta hosp, 250-bed, COMMZ.			42.5	6,930														
15	M26505	Sta hosp, 300-bed, COMMZ.	2,608	1,130	53.15	7,047	4	860	290	387	45.9	6,502	2	3,036	2,898	1,517	106.0	15,016	6	3,896
16	M26574	Sta hosp, 500-bed, COMMZ.	2,550	1,735	63.1		6	1,260	483	1,282	99.6	12,185	6	1,660	3,033	3,017	182.1	24,653	12	2,920
17	M26711	Sta hosp, 750-bed, COMMZ.	2,778	2,271	81.7		9	2,350	512	1,852	110.6	12,803	6	1,750	3,290	4,123	238.2	36,055	15	4,100
18	M27533	Hosp expansion, 20-bed, COMMZ.			3.45	50														
19	M27670	Hosp expansion, 25-bed, COMMZ.	399		3.73	543	LCL	60												
20	M27807	Hosp expansion, 50-bed, COMMZ.	408	171	6.4	984	LCL	112												
21	M28081	Hosp expansion, 100-bed, COMMZ.	463	279	14.0	2,140	1	300												
22	M29177	MASH, 60-bed	1,167	406	17.55	2,556	1	185	165	514	26.3	2,985	1	300	1,332	920	42.3	5,343	2	485

Table 5–9. Items of Construction and Fortification Materials

1	Item	2 MTON	3 STON
2	Brick, masonry, pressed	1. 00	2. 80
3	Brick, masonry, common	1. 00	2. 40
4	Brick, masonry, soft	1. 00	2. 00
5	Cement, portland, loose	1. 00	1. 80
6	Cement, portland, set	1. 00	3. 70
7	Concrete masonry	1. 00	2. 40
8	Dynamite, military (50 lb per box)	1. 00	1. 00
9	Earth, dry, loose	1. 00	1. 50
10	Earth, dry, packed	1. 00	1. 90
11	Gravel, loose	1. 00	2. 10
12	Rock, crushed	1. 00	2. 00
13	Rubble, dry, masonry	1. 00	2. 60
14	Sand, dry	1. 00	1. 80
15	Sand, gravel	1. 00	2. 00
16	Tar, bituminous	1. 00	1. 50
17	White pine	1. 00	0. 60
18	Detonating cord, 3,000 ft per box (100 boxes)	6. 30	3. 80
19	Time fuze, blasting (100 boxes)	9. 80	4. 70
20	Railroad track, 98 lb per m, rail per km of single track	29. 76	98. 27
21	Railroad track, rail turnout, complete, 98 lb per m (each)	4. 15	5. 95
22	Pipe, 4-in. lt, with couplings (100 20-ft sec)	6. 50	4. 50
23	Pipe, 4-in. std, with couplings (100 20-ft sec)	6. 50	10. 40
24	Pipe, 6-in. lt, with couplings (100 20-ft sec)	14. 10	9. 20
25	Pipe, 6-in. std, with couplings (100 20-ft sec)	14. 10	15. 70
26	Pipe, 8-in. lt, with couplings (100 20-ft sec)	24. 40	11. 70
27	Pipe, 8-in. std, with couplings (100 20-ft sec)	24. 40	23. 50
28	Pipe, 12-in. lt, with couplings (100 20-ft sec)	52. 40	21. 80
29	Pipe, 12-in. std, with couplings (100 20-ft sec)	52. 40	43. 20
30	Pipe, 16-in. std, welded (100 20-ft sec)	82. 30	52. 40
31	Tank, steel-bolted, 1,000-bbl	11. 50	10. 75
32	Tank, steel-bolted, 3,000-bbl	30. 00	17. 00
33	Tank, steel-bolted, 10,000-bbl	70. 30	44. 10
34	Tank, collapsible, 238-bbl, with hose manifold	2. 10	0. 70

Section IV. CLASS III SUPPLY

5–7. Liquid Fuel and Lubricant Data

Tables 5–10 through 5–19 were extracted from FM 5–34, FM 5–35, FM 5–144, FM 55–15, FM 101–20, SB 700–20, and TM 9–500.

5–8. Estimating Class III Requirements

a. Estimating Solid Fuel Requirements. The factors below are based on the use of coal only, assuming use of no petroleum products or gas. When firewood or peat is substituted, 2 pounds of such fuel is required in lieu of 1 pound of coal. Factors apply to temperate climate.

(1) *Utilities.*

	Item Weight
Space, water heating, and cooking, per man per day	4 lb
Cooking only, per man per day	1. 5 lb
Hospital use, per bed per day:	
Winter	12 lb
Summer	5 lb
Laundry, fixed, per unit per day	32 STON

Table 5–10. Vehicle Fuel and Lubricant Data

1	1	2	3	4	5	6	7	8
	Line item number	Vehicle	Type of fuel	Vehicle fuel tank capacity (gal)	Fuel (gal per km)	Oil per 100 km (gal)	Gear lubricant per 100 km (lb)	Miscellaneous greases per 100 km (lb)
2	B04578	Automobile, sedan, hv	Gas	20. 0	0. 044	0. 1	0. 1	0. 1
3	B04578	Automobile, sedan, mdm	Gas	19. 0	0. 045	0. 1	0. 1	0. 1
4	B04715	Automobile, sedan, lt	Gas	16. 0	0. 036	0. 1	0. 1	0. 1
5	D10725	Carr, 81-mm mort, full-tracked	Gas	136. 5	0. 74	1. 3		1. 3
6	D10740	Carr, 107-mm mort, SP	Gas	136. 5	0. 74	1. 3		1. 3
7	D11048	Carr, cgo, tracked, 6-ton, M548	Diesel	105. 0	0. 22			
8	D11401	Carr, comd and recon, armd, M114	Gas	110. 0	0. 227			
9	D11538	Carr, CP, lt, tracked, M577A1	Diesel	120. 0	0. 248			
10	D12086	Carr, pers, full-tracked, armd, M113	Gas	80. 0	0. 25			
11	E56577	CEV, full-tracked, M728	Diesel	375. 0	0. 555			
12	H56391	Fftg equip set, trk-mtd, AACFT crash, os, cl 530B	Gas	78. 0	0. 091	0. 3	0. 5	0. 3
13	J96819	Gun, antiaircraft arty, SP, 40-mm, M42	Gas	144. 0	1. 13			
14	J96956	Gun, at, SP, 90-mm, M56	Gas	55. 0	0. 31			
15	J97230	Gun, FA, SP, 175-mm, M107	Diesel	300. 0	0. 42			
16	K27486	Heating and tiedown unit, 7.62-mm rkt, trk-mtd, with equip, M78A1.	Diesel	78. 0	0. 227	0. 5	0. 3	0. 3
17	K56981	How, hv, SP, 8-in., M110	Diesel	300. 0	0. 416	2. 5	1. 1	1. 8
18	K57255	How, lt, SP, 105-mm, M108	Diesel	135. 0	0. 381	2. 4	0. 9	1. 6
19	K57666	How, mdm, SP, 155-mm, M109	Diesel	135. 0	0. 381	2. 4	0. 9	1. 6
20	K90188	Inst rep shop, trk-mtd, 2½-ton, 6x6, with equip	Gas	50. 0	0. 125	0. 3	0. 5	0. 3
21	L45534	Lchr, rkt, 7.62-mm, trk-mtd, with equip, M386	Gas	78. 0	0. 227			
22	R50543	Recov veh, full-tracked, lt, armd, M578	Diesel	320. 0	0. 416			
23	R50680	Recov veh, full-tracked, mdm, M88	Gas	445. 0	1. 25			
24	T10138	Shop equip, contact maint, trk-mtd	Gas	50. 0	0. 069	0. 3	0. 5	0. 3
25	T13152	Shop equip, org rep, lt, trk-mtd	Gas	24. 0	0. 069	0. 1	0. 2	0. 2
26	V12826	Tk, cbt, full-tracked, 76-mm gun, M41A3	Gas	140. 0	0. 91	2. 3	0. 9	0. 9
27	V12963	Tk, cbt, full-tracked, 90-mm gun, M48A2	Multifuel	335. 0	1. 320			
28	V13100	Tk, cbt, full-tracked, 105-mm gun, M60A1	Diesel	375. 0	0. 71	3. 2	1. 3	0. 6
29	X38639	Trk, amb, ¼-ton, 4x4, with equip, M718	Gas	20. 0	0. 044	0. 2	0. 1	0. 2
30	X38776	Trk, amb, ¾-ton, 4x4, with equip, M43B1	Gas	24. 0	0. 069	0. 1	0. 2	0. 1
31	X39735	Trk, cgo, ¾-ton, 4x4, with equip, M37B1	Gas	24. 0	0. 069	0. 1	0. 2	0. 2
32	X40009	Trk, cgo, 2½-ton, 6x6, with equip, M35A2	Multifuel	30. 0	0. 055	0. 3	0. 5	0. 3

Table 5-10. Vehicle Fuel and Lubricant Data—Continued

1	1 Line Item number	2 Vehicle	3 Type of fuel	4 Vehicle fuel tank capacity (gal)	5 Fuel (gal per km)	6 Oil per 100 km (gal)	7 Gear lubricant per 100 km (lb)	8 Miscellaneous greases per 100 km (lb)
33	X40831	Trk, cgo, 5-ton, 6x6, LWB, with equip, M54A2	Multifuel	78. 0	0. 116	0. 5	0. 3	0. 3
34	X41790	Trk, cgo, 10-ton, 6x6, WWN, with equip, M125	Gas	220. 0	0. 207	0. 5	0. 3	0. 3
35	X43228	Trk, dump, ¾-ton, 4x4, with equip, XM708	Gas	24. 0	0. 069	0. 1	0. 2	0. 2
36	X43297	Trk, dump, 2½-ton, 6x6, with equip, M342A2	Gas	50. 0	0. 104	0. 3	0. 5	0. 3
37	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip, M51A2	Gas	110. 0	0. 115	0. 5	0. 3	0. 3
38	X55627	Trk, platform, util, ¼-ton, 4x4, with equip, M274A4	Gas	8. 0	0. 049	0. 1	0. 1	0. 1
39	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip	Diesel	78. 0	0. 116	0. 5	0. 3	0. 3
40	X57271	Trk, tk, fuel-svc, 2½-ton, 6x6, with equip	Multifuel	50. 0	0. 055	0. 3	0. 5	0. 3
41	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip	Gas	50. 0	0. 089	0. 3	0. 5	0. 3
42	X59326	Trk, trac, 5-ton, 6x6, with equip, M52A2	Diesel	110. 0	0. 115	0. 4	0. 6	0. 5
43	X59600	Trk, trac, 10-ton, 6x6, with dual-midship winch, with high-mtd 5th wheel, with equip, M123.	Gas	166. 0	0. 625	0. 5	0. 5	0. 6
44	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip	Gas	78. 0	0. 141	0. 3	0. 5	0. 3
45	X60833	Trk, util, ¼-ton, 4x4, with equip, M151A	Gas	17. 0	0. 044	0. 1	0. 1	0. 1
46	X61929	Trk, van, expansible, 2½-ton, 6x6, with equip, M292A2	Gas	50. 0	0. 089	0. 3	0. 5	0. 3
47	X62237	Trk, van, expansible, 5-ton, 6x6, with equip, M291A2	Gas	78. 0	0. 116	0. 5	0. 3	0. 3
48	X62340	Trk, van, shop, 2½-ton, 6x6, with equip, M109A3	Gas	50. 0	0. 089	0. 3	0. 5	0. 3
49	X63025	Trk, wkr, crane, 2½-ton, 6x6, WWN, with equip, M108	Gas	50. 0	0. 089	0. 3	0. 5	0. 3
50	X63094	Trk, wkr, ¾-ton, 4x4, with equip, XM711	Gas	24. 0	0. 069	0. 1	0. 2	0. 2
51	X63162	Trk, wkr, 2½-ton, 6x6, WWN, with equip, M60A2	Gas	50. 0	0. 104	0. 3	0. 5	0. 3
52	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip, M543A2	Gas	78. 0	0. 116	0. 5	0. 3	0. 3
53	Y35486	Water purification equip set, trk-mtd, diatomite filter, 1,500-gph	Gas	50. 0	0. 089	0. 3	0. 5	0. 3

Table 5-11. Construction Equipment Fuel Data

1	1 Line item number	2 Item	3 Type of fuel	4 Estimated average rate of consumption (gal per hr)
2	A26647	Air conditioner, tlr-mtd, 26,500 BTU	Gas	3. 0
3	B01756	Auger, earth, skid-mtd, 9-ft bore depth	Gas	3. 0
4	B43025	Batching plant, cement, 1 comp, 84.6-ton bin, 50-ton-per-hr	Gas	2. 0
5	B83445	Bt, brg erection, inboard eng, aluminum, 19-ft long	Gas	9. 0
6	B83582	Bt, brg erection, inboard eng, aluminum, 27-ft long	Gas	18. 0
7	B85952	Boiler, steam, high-pressure, skid-mtd, 12-hp	Oil	4. 0
8	E68146	Compressor, reciprocating, power-driven, air, 15 cfm, 100 psi	Gas	2. 0
9	E69105	Compressor, reciprocating, power-driven, air, 5 cfm, 175 psi	Gas	1. 0
10	E69242	Compressor, reciprocating, power-driven, air, 15 cfm, 175 psi	Gas	2. 0
11	E69653	Compressor, reciprocating, power-driven, air, skid-mtd, 15 cfm, 75 psi	Gas	2. 0
12	E69790	Compressor, reciprocating, power-driven, air, skid-mtd, 55 cfm, 100 psi	Gas	2. 0
13	E69927	Compressor, reciprocating, power-driven, air, skid-mtd, 105 cfm, 100 psi	Gas	1. 0
14	E70475	Compressor, reciprocating, power-driven, air, tlr-mtd, 55 cfm, 80 psi	Gas	1. 0
15	E70680	Compressor, reciprocating, power-driven, air, tlr-mtd, 315 cfm, 100 psi	Diesel	4. 0
16	E70886	Compressor, reciprocating, power-driven, air, wheel-mtd, 15 cfm, 3,500 psi	Gas	6. 0
17	E72393	Compressor, rot, power-driven, air, skid-mtd, 125 cfm, 100 psi	Gas	4. 0
18	E72804	Compressor, rot, power-driven, air, tlr-mtd, 250 cfm, 100 psi	Diesel	3. 0
19	E73352	Compressor, rot, power-driven, air, wheel-mtd, 600 cfm, 100 psi	Diesel	6. 0
20	E73626	Compressor, rot, power-driven, air, 60 cfm, 6.5 psi	Gas	1. 0
21	F39241	Crane, wheel-mtd, 5-ton, ⅜-cu yd, 4x4, rough terrain, air-trans	Diesel	4. 3
22	F39515	Crane-shovel, basic unit, crawler-mtd, 10-ton, ¾-cu yd	Gas	4. 0
23	F40474	Crane-shovel, basic unit, crawler-mtd, 40-ton, 2-cu yd	Diesel	8. 2
24	F43077	Crane-shovel, wheel-mtd, 7-ton, ½-cu yd, with 24-ft boom crane, 9-ton block and tackle.	Gas	4. 8
25	F43414	Crane-shovel, trk-mtd, 20-ton, ¾-cu yd, with 20-ton block and tackle, 30-ft. boom crane.	Gas	4. 0
26	F49399	Crushing and screening plant, wheel-mtd, 75-ton-per-hr	Diesel	9. 0
27	F49673	Crushing, screening, and washing plant, wheel-mtd, 225-ton-per-hr	Diesel	10. 0
28	F56728	Curing mach, concrete, 20-ft, with pump	Gas	2. 0
29	G28212	Distr water, tk-type, trk-mtd, 1,000-gal	Gas	1. 5
30	H55069	Finishing mach, concrete-paving, 20-ft	Gas	2. 0
31	J74920	Grader, rd, motorized, 10,000-lb, 12-ft blade	Diesel	8. 0
32	----------	Grader, rd, motorized, 8,975-lb pressure at blade, 10-ft blade	Diesel	5. 0
33	----------	Grader, rd, motorized, 8,000- to 12,000-lb DBP	Diesel	8. 0
34	----------	Grader, rd, motorized, tandem, 12,500- to 14,475-lb DBP, 12 ft	Diesel	----------
35	----------	Grader, rd, motorized, 12,000- to 17,000-lb DBP	Dicsel	8. 0
36	K04697	Hammer, piledriver, self-powered, 7,500-ft-lb	Diesel	1. 0
37	L76351	Loader, scoop-type, 4-wheel, 1½-cu yd	Diesel	4. 8
38	L76625	Loader, scoop-type, 4-wheel, 2½-cu yd, with multisegment bucket	Diesel	5. 9
39	M54151	Mixer, concrete, tlr-mtd, 16-cu ft	Gas	2. 0
40	N74624	Paver, concrete, crawler-mtd, dual-drum, 34-cu ft	Gas	2. 0
41	N75124	Paving mach, bituminous mat, crawler-mtd, 12-ft	Gas	3. 0
42	S11068	Roller, motorized, tandem, 2 rollers, 5- to 8-ton	Gas	5. 0
43	S11205	Roller, motorized, tandem, 3 rollers, 9- to 14-ton	Gas	5. 0
44	S11479	Roller, motorized, 10-ton, 3-wheel, with scarifier and sprinkler	Gas	5. 0
45	S40029	Sawmill, cir stlr-mtd	Diesel	13. 0
46	U12200	Spreader, concrete, 25-ft spread	Gas	1. 0
47	U76871	Sweeper, rot, towed, 3-wheel	Gas	5. 0
48	W77364	Trac, full-tracked, low-spd, hv DBP	Diesel	7. 2
49	W80926	Trac, full-tracked, low-spd, mdm DBP	Diesel	5. 7
50	W86269	Trac, full-tracked, low-spd, 8,600- to 12,000-lb DBP	Diesel	9. 0
51	W88735	Trac, walking, power-driven, wheel-mtd, 20-hp	Gas	3. 0
52	W90790	Trac, wheeled, ind, mdm DBP	Diesel	7. 2

Table 5-11. Construction Equipment Fuel Data—Continued

1	1 Line item number	2 Item	3 Type of fuel	4 Estimated average rate of consumption (gal per hr)
53	W90927	Trac, wheeled, ind, lt DBP	Diesel	7. 2
54	W91201	Trac, wheeled, ind, 3,000- to 3,700-lb DBP	Gas	25. 0
55	W92160	Trac, wheeled, ind, 3,725- to 5,175-lb DBP	Gas	25. 0
56	X51106	Trk, lift, fork, solid rubber tires, 2,000-lb	Gas	3. 3
57	X51380	Trk, lift, fork, pneumatic tires, 4,000-lb	Gas	3. 3
58	X51928	Trk, lift, fork, pneumatic tires, 6,000-lb, rough terrain	Gas	3. 5
59	X52476	Trk, lift, fork, pneumatic tires, 10,000-lb, rough terrain	Gas	3. 2
60	X52750	Trk, lift, fork, pneumatic tires, 15,000-lb	Gas	4. 7

Table 5-12. Army Aircraft Fuel Data

1	1 Line item number	2 Model	3 Grade of fuel	4 Internal fuel capacity (gal)	5 Fuel consumption per cruise hour (gal)	6 Type of engine oil	7 Engine oil consumption per hour (gal)
2	A30071	O-1A	115/145	42	8. 6	GD1100	0. 29
3	A30111	O-1D	115/145	42	----------	GD1100	----------
4	A30132	O-1G	115/145	41	----------	GD1100	----------
5	A30171	OV-1A	JP-4	297	122. 0	7808	0. 04
6	A30221	OV-1B	JP-4	297	127. 0	7808	0. 04
7	A30271	OV-1C	JP-4	297	121. 0	7808	0. 04
8	A30371	TO-1D	80/87	41	8. 6	GD1100	0. 29
9	A30596	T-42A	100/130	142	27. 62	22851	----------
10	A30621	U-1A	115/145	213	31. 0	GD1100	2. 19
11	A30671	U-6A	115/145	138	19. 5	GD1100	0. 7
12	A30721	U-8D	115/145	230	31. 5	GD1100	1. 22
13	A30821	U-8F	115/145	230	30. 0	GD1100	1. 22
14	A30871	U-9B/G	115/145	233	29. 7	GD1100	0. 6
15	A30971	U-10A	100/130	60	----------	1080	----------
16	K29660	AH-1G	JP-4	248	----------	7808	----------
17	K29797	TH-13T	100/130	57	21. 2	22851	1. 0
18	K30234	CH-34A	115/145	262	97. 0	GD1100	5. 17
19	K30254	CH-34C	115/145	262	97. 0	GD1100	5. 17
20	K30291	CH-37B	115/145	410	166. 4	GD1100	27. 2
21	K30378	CH-47A	JP-4	630	245. 3	7808	0. 28
22	K30645	OH-6A	JP-4	62	22. 0	7808	0. 05
23	K30682	OH-13E	91/96	29	16. 2	22851	0. 05
24	K30702	OH-13G	91/96	42	16. 2	GD1100	0. 27
25	K30719	OH-13H	80/87	42	17. 0	GD1100	0. 27
26	K30746	OH-13S	100/130	57	18. 0	GD1100	0. 27
27	K30900	OH-23C	115/145	28	15. 0	GD1100	0. 48
28	K30917	OH-23D	115/145	48	16. 1	GD1100	0. 48
29	K30961	OH-23G	115/145	46	21. 9	GD1100	0. 48
30	K31722	UH-1A	JP-4	125	56. 7	7808	0. 02
31	K31749	UH-1B	JP-4	165	60. 6	7808	0. 02
32	K31786	UH-1D	JP-4	224	63. 2	7808	0. 02

Table 5–13. Locomotive Fuel Oil Consumption (Oil-Burning Steam Locomotive)

1	1 Type of locomotive	2 Type of operation	3 Estimated average rate of fuel oil consumption	
			Lb per tn-km.	Lb per hr
2	2–8–0 std-gage	Road	35	450
3	2–8–2 narrow-gage	Road	38	500

(2) *Steam locomotives.* Table 5–20 includes coal consumption data for steam locomotives.

(*a*) In estimating coal requirements, add 10 percent to computed rate of consumption to allow for spillage and waste.

(*b*) For general planning purposes assume operation of switch engines for 20 hours a day; allow 4 hours a day for maintenance.

b. Estimating Liquid Fuel Requirements. The major factors controlling liquid fuel requirements in military operations are discussed in (1) through (6) below.

(1) *Displacement.* The average distance that each vehicle moves is determined by measuring the distance that the center of mass moves. Administrative or march movements are computed on the basis of using available road nets. Movements under battle conditions are computed on the basis of selected elements of the organization proceeding cross country. Experience tables provide consumption data for moving an organization. For

Table 5–14. Locomotive Diesel Oil Consumption

1	1 Type of locomotive	2 Type of operation	3 Estimated average rate of diesel oil consumption	
			Gal per tn-km in rd svc	Gal per hr in switching svc
	Standard gage:			
2	0—4—4—0, diesel-elec, 60-ton.	Road-switcher	0. 54	8. 0
3	0—6—6—0, diesel-elec, 120-ton.	Road-switcher	1. 5	11. 5
	Narrow gage:			
4	0—4—4—0, diesel-elec, 48-ton.	Road-switcher	0. 54	8. 0
5	0—6—6—0, diesel-elec, 80-ton.	Road-switcher	0. 9	10. 0

Table 5–15. Marine Equipment Fuel Data

1	1 Line item number	2 Item	3 Type of fuel	4 Estimated average rate of consumption (gal per hr)
2	B83993	Bt, pax and cgo	Diesel	19. 0
3	B84130	Bt, picket, 36- to 47-ft	Diesel	18. 0
4	B84267	Bt, picket, 52- to 65-ft	Diesel	25. 0
5	F35953	Crane, barge, 60-ton	Diesel	16. 0
6	F36090	Crane, barge, 89- to 250-ton	Diesel	25. 0
7	L36739	LCM, 69-ft	Diesel	41. 0
8	L36876	LCU, 115-ft	Diesel	34. 0
9	L36945	LCVP	Diesel	15. 0
10	L37013	Ldg veh, tracked, comd (P5A1)	Gas	47. 0
11	L37030	Ldg veh, tracked, engr (LVTE–1)	Gas	53. 3
12	L37118	LVTP (LVTP–5A1)	Gas	47. 0
13	L37132	Ldg veh, tracked, recov (LVTR–1A1)	Gas	47. 0
14	L67508	Lighter, amph, SP, steel, 60-ton, 61-ft	Diesel	40. 0
15	P78995	Propelling unit, outboard, 165-bhp	Diesel	10. 0
16	X70772	Tug, 200- to 440-hp	Diesel	12. 0
17	X70909	Tug, 600- to 650-hp	Diesel	41. 0
18	X71046	Tug, 1,200- to 1,530-hp	Diesel	83. 0
19	Y00176	Ves, liq-cgo	Diesel	96. 0

Table 5-16. Power Unit Fuel Data

1	1 Line item number	2 Item	3 Type of fuel	4 Estimated average rate of consumption (gal per hr)
2	J35424	Genr set, PU-402/M, tlr-mtd	Diesel	2.0
3	J35561	Genr set, PU-407/M, tlr-mtd	Diesel	3.4
4	J35698	Genr set, PU-408/M, trk-mtd	Diesel	3.4
5	J40767	Genr set, PU-236/G, tlr-mtd	Gas	1.5
6	J40904	Genr set, PU-248/U, tlr-mtd	Gas	1.1
7	J41041	Genr set, PU-253/U, tlr-mtd	Gas	2.2
8	J41109	Genr set, PU-269, tlr-mtd	Gas	2.2
9	J41178	Genr set, PU-290/MR, tlr-mtd	Gas	1.2
10	J41315	Genr set, PU-294/G, tlr-mtd	Gas	3.0
11	J41589	Genr set, PU-322/G, tlr-mtd	Gas	0.7
12	J41786	Genr set, PU-332/U, tlr-mtd	Gas	1.1
13	J41819	Genr set, PU-375A/G, tlr-mtd	Gas	2.2
14	J41863	Genr set, PU-378/U, tlr-mtd	Gas	2.2
15	J41897	Genr set, PU-409/M, tlr-mtd	Gas	1.5
16	J41931	Genr set, PU-456/G, tlr-mtd	Gas	3.2
17	J42000	Genr set, PU-474/U, tlr-mtd	Gas	3.2
18	J42411	Genr set, PE-162, skid-shock-mtd	Gas	0.25
19	J42548	Genr set, PE-214/BCD, shock-mtd	Gas	0.14
20	J45288	Genr set, PE-75/AF, skid-shock-mtd	Gas	0.65
21	J45767	Genr set, PU-450/G, skid-mtd	Gas	1.2
22	J46247	Genr set, PU-465/G, skid-shock-mtd	Gas	1.0
23	J46795	Genr set, PU-286, base-mtd	Gas	1.5
24	J47206	Genr set, PU-236B/G, tlr-mtd	Gas	1.5
25	J47343	Genr set, PU-409A/M, tlr-mtd	Gas	1.5
26	J49672	Genr set, PE-95K, skid-mtd	Gas	1.1
27	J49809	Genr set, PU-332/A, tlr-mtd	Gas	1.1
28	J50288	Genr set, PU-26/U, skid-mtd	Gas	2.2

Table 5-17. Miscellaneous Fuel Data

1	1 Line item number	2 Item	3 Type of fuel	4 Estimated average rate of consumption (gal per hr)
2	F00218	Conversion unit, CO_2, stlr-mtd, 260 lb-per-hr	Gas	2.1
3	J30766	Genr and chg plant, acetylene, stlr-mtd, 750 cfh	Gas	1.0
4	J31725	Genr and chg plant, oxy-nitrogen, stlr-mtd, 5-ton-oxy-/200-ib-nitrogen-per-day.	Diesel	38.0
5	K24862	Heater, duct-type, ptbl, gas, 250,000 BTU, wheel-mtd	Gas	2.0 to 4.0
6	L48315	Ldry unit, tlr-mtd, 30-lb cap, drying tumbler	Gas	5.0
7	R65818	Refrigeration unit, mech, pnl-type	Gas	0.9 to 1.25

Table 5-18. Bulk Petroleum Capacities

1	1 Line item number	2 Type of carrier	3 Amount carried (gal)
		Barges:	
2	B30786	Har and canal	15,000 to 30,000
3	B30923	Coastwise	200,000 to 400,000
4	----------	Navy pon	84,000
		Pipelines:	
5	----------	4-in	304,000 per day
6	----------	6-in	655,000 per day
7	----------	8-in	1,135,000 per day
		Railroad tk cars, petrl:	
8	R03112	Fgn, narrow-gage	6,000
9	R03249	Fgn, broad-gage	10,000
10	R03523	Dom	10,000
		Ships:	
11	----------	Large tanker	2.5 to 11 million
12	----------	Small tanker	600,000 to 2 million
		Stor tks:	
13	V15292	Collapsible, fabric	900; 3,000; 10,000
14	V15566	Horiz, skid-mtd	600
15	V16696	Bolted steel	10,500; 42,000; 420,000
16	X23327	Transporter, liq, rolling-wheel-type	1,000
17	X57408	Trk, tk, fuel-svc, 2½-ton, 6×6	1,200
18	X59463	Trk, trac, 5-ton, 6×6, with stlr, tk, fuel, 12-ton	5,000

planning purposes the assumption is that cross-country-battle fuel consumption is at a rate of 2.5 times that given for road movements in the fuel data tables in paragraph 5–9.

(2) *Supply.* During a displacement certain vehicles of an organization must make round-trip supply hauls. Since these hauls generally are made to supply points located at varying distances from the organization, an average round-trip supply distance must be determined. Experience indicates that daily requirements for supply hauls are about equal to 10 percent of the total organizational consumption per kilometer or displacement multiplied by the average round-trip supply distance. When the organization is not on the move, supply haul requirements are included in the composite requirement described in (4) below and are not computed separately.

(3) *Service.* Supplemental daily requirements exist for movement of vehicles in bivouac areas and on reconnaissance, engine warmup, and abnormal periods of low-gear operation. These items will differ with the nature of the operation, weather, roads, and terrain and must be estimated in accordance with general conditions. Under average conditions these requirements can be estimated by using the consumption necessary to move all vehicles in the organization 16 kilometers over roads. This factor applies when the organization is on the march or in combat.

(4) *Housekeeping.* Additional daily requirements exist for administrative vehicles, kitchens, and gasoline-powered equipment and for maintaining and testing engines. When the organization is not on the march, these requirements are grouped in a composite daily requirement as noted under each fuel data table (tables 5–22 through 5–28). When the organization is on the move, the requirements for administrative vehicles (not supply hauls) and gasoline-powered equipment are absorbed by maintenance, and the testing factor is absorbed by the service factor. However, the kitchen requirement must be added on the basis of a daily consumption per kitchen of 15 gallons of gasoline.

(5) *Wastage.* This factor covers evaporation, spillage, and small combat losses. It applies only to road movement in the combat zone. Its computation is 10 percent of the sum of all other consumption figures.

Table 5-19. Weights, Volumes, and Conversion Factors for Petroleum Products

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Product	Packaging	Wt (lb)	Cu ft		Conversion factors		Gal per STON	Gal per LTON	Gal per MTON [1]	Bbl per LTON [1]	Packages per STON	Packages per LTON	Packages per MTON	Cap of veh for carrying filled containers [2]		
				Actual	Planning factor	Gal to lb	Lb to gal								1½-ton tlr	2½-ton trk	5-ton trk
2	AVGAS	Bulk				5.90	0.169	339.0	379.7		9.04						
		55-gal drums [3]	373.0	9.03	11	6.91	0.145	289.4	324.2	187.8		5.36	6.00	3.48	8	14	28
		55-gal drums [4]	389.0	8.80	11	7.20	0.139	277.8	311.1	192.8		5.14	5.76	3.57	8	13	26
		55-gal drums [5]	364.0	9.20	11	6.90	0.145	289.9	324.6	181.2		5.49	6.15	3.42	9	14	28
		5-gal cans [6]	40.5	0.81	1	8.00	0.125	250.0	280.0	200.0		49.40	55.30	40.00	74	124	248
3	Jet fuel (JP-4)	Bulk				6.42	0.156	312.0	349.4		8.058						
		55-gal drums [3]	399.0	9.03	11	7.39	0.135	270.0	302.4	187.8		5.01	5.61	3.48	8	13	25
		55-gal drums [4]	415.0	8.80	11	7.68	0.130	260.0	291.2	192.7		4.82	5.40	3.57	8	12	24
		55-gal drums [5]	392.0	9.20	11	7.40	0.135	270.0	302.4	181.2		5.10	5.71	3.42	8	14	28
4	MOGAS	Bulk				6.11	0.164	327.3	366.6		8.73						
		55-gal drums [3]	384.0	9.03	11	7.11	0.141	281.2	315.1	187.8		5.21	5.83	3.48	8	13	26
		55-gal drums [4]	400.0	8.80	11	7.41	0.135	269.9	302.3	192.8		5.00	5.60	3.57	8	13	26
		55-gal drums [5]	376.0	9.20	11	7.09	0.141	282.1	315.9	181.2		5.32	5.96	3.42	8	14	28
		5-gal cans [6]	41.6	0.81	1	8.32	0.120	240.4	269.2	200.0		48.10	53.80	40.00	73	121	242
5	Diesel fuel	Bulk				6.99	0.143	286.1	320.5		7.63						
		55-gal drums [3]	432.0	9.03	11	8.00	0.125	250.0	280.0	187.8		4.63	5.19	3.48	7	12	24
		55-gal drums [4]	448.0	8.80	11	8.30	0.120	241.0	269.9	192.7		4.46	5.00	3.57	7	12	24
		55-gal drums [5]	430.0	9.20	11	8.11	0.123	246.6	276.2	181.2		4.65	5.21	3.42	7	12	24
		5-gal cans [6]	46.0	0.81	1	9.20	0.109	317.4	243.5	200.0		43.50	48.70	40.00	66	109	218
6	Kerosene	Bulk				6.80	0.147	294.1	329.4		7.84						
		55-gal drums [3]	421.0	9.03	11	7.80	0.128	256.4	287.1	187.8		4.75	5.32	3.48	8	12	24
		55-gal drums [4]	437.0	8.80	11	8.09	0.124	247.2	276.9	192.8		4.58	5.13	3.57	7	12	24
		55-gal drums [5]	351.0	9.20	11	6.62	0.151	302.1	338.3	181.2		5.70	6.38	3.42	9	15	30
		5-gal cans [6]	45.0	0.81	1	9.00	0.111	222.2	248.9	200.0		44.40	49.80	40.00	67	112	224

7	Lub oils	Bulk				7.60	0.132	263.2	294.7		7.02						
		55-gal drums [3]	472.0	9.03	11	8.58	0.117	233.1	261.0	191.3		4.24	4.75	3.48	7	11	22
		55-gal drums [4]	488.0	8.80	11	8.87	0.113	225.5	252.5	196.4		4.10	4.59	3.57	7	11	22
		55-gal drums [5]	462.0	9.20	11	8.56	0.117	233.6	261.7	184.6		4.33	4.85	3.42	7	11	22
		5-gal cans [6]	49.0	0.81	1	9.80	0.102	204.1	228.6	181.2		40.80	45.70	40.00	62	103	206
		1-qt cans (12 per case).	35.0	0.88	1							58.00	64.90	40.00	86	143	286
		1-qt cans (24 per case).	60.0	1.60	2							33.40	37.30	20.00	50	84	168
		5-qt cans (6 per case).	77.0	1.90	2							26.00	29.10	20.00	39	65	130
8	Greases	25-lb pails	29.0	0.95	1							69.00	77.20	40.00	104	173	346
		5-lb cans (6 per case).	44.0	1.10	2							45.40	50.90	20.00	69	114	227
	Fog oils:																
9	SGF1	Bulk				7.11	0.140	281.0	314.0		7.49						
		55-gal drums [3]	438.0	9.03	11	8.11	0.123	246.6	276.2	191.3		4.50	5.02	3.48	7	11	22
		55-gal drums [4]	588.0	8.80	11	8.40	0.110	238.0	266.6	196.4		4.32	4.84	3.57	7	11	22
		55-gal drums [5]	421.0	9.20	11	8.10	0.123	246.9	276.5	184.6		4.57	5.12	3.42	7	11	22
10	SGF2	Bulk				6.99	0.143	286.0	320.0		7.63						
		55-gal drums [3]	431.0	9.03	11	7.99	0.120	250.3	280.3	191.3		4.54	5.09	3.48	7	11	22
		55-gal drums [4]	616.0	8.80	11	8.28	0.120	241.5	270.5	196.4		4.39	4.90	3.57	7	11	22
		55-gal drums [5]	478.0	9.20	11	7.90	0.121	253.1	283.5	184.6		4.68	5.25	3.42	7	11	23

[1] For ocean-shipping, storage, and pipeline computations, bulk petroleum products usually are measured in bbl of 42 gal each or in LTON.
[2] Based on authorized loads in STON. When overloads are authorized, these quantities may be increased to the cubic capacity of the veh or to 100-percent overweight, whichever limit is reached first.
[3] 18-gage standard—weighs 54 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.
[4] 11-gage standard—weighs 70 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.
[5] 18-gage limited standard—weighs 52 lb empty—filled to 53 gal with light products, 54 gal with heavy products. Federal Specification PPP-D-729.
[6] For planning purposes, weight of gas may be taken as 42 lb and weight of lub oil for engines as 50 lb per 5-gal can, including weight of can. Cans, 5-gal, weigh approximately 11 lb empty.

Note. Factors in this table are based on U.S. gal.

Table 5-20. Steam Locomotive Coal Requirements

1	2	3	4
Type of locomotive	Type of operation	Average rate of consumption	
		Lb per tn-km	Lb per hr
2-8-0, 82-ton, std-gage	Road	56	700
2-8-0, 90-ton, std-gage	Road	71	950
2-8-2, 60-ton, narrow-gage	Road	62	750

(6) *Example.* An infantry division (mechanized) (table 5-26) including seven infantry battalions (mechanized) and three tank battalions (table 5-27) is to make the following movement: 1st day—150 kilometers in zone to bivouac area at field army rear boundary; 2d day—no movement; 3d day—100 kilometers forward in combat zone; and 4th day—10 kilometers, with 8 kilometers under cross-country battle conditions for all elements except the division support command (DISCOM). Average round-trip supply distances are: 1st day—50 kilometers; 2d day—30 kilometers; 3d day—60 kilometers; and 4th day—50 kilometers. Estimate the diesel and gasoline requirements for the 4-day period.

***Caution:* Paragraph 5-9 contains supplemental information and data necessary to determine complete solutions to estimated requirements.**

1st day

(*a*) Displacement of 150 km:

1. Diesel requirements:

Multiply 150 km by 143.13 gal per km (from table 5-26, column 3) and by 169.29 gal per km (for 7 inf (mech) and 3 tk bns) (table 5-27, column 3)-- =46,863

2. Gasoline requirements:

Multiply 150 km by 156.18 and 255.79 gal per km (from same tables, column 4) ---------- =60,735

(*b*) Supply requirements:

1. Diesel—multiply 50 km (supply distance) by 31.24 (10 percent of division consumption per km)----- =1,562

2. Gasoline—Multiply 50 km (supply distance) by 41.20 (10 percent of division consumption per km)----- =2,060

(*c*) Service requirements:

1. Diesel—multiply 16 km by 312.4 (total division consumption per km) ---------- =4,998

2. Gasoline—multiply 16 km by 412.0 (total division consumption per km)---------- =6,592

(*d*) Kitchen requirements:

Gasoline—multiply 15 gal by 123 organic kitchens---------- =1,845

2d day

(*e*) Requirements when division is not on the march (from para 5-9*b*(4)):

Gasoline ---------- =4,000

3d day

(*f*) Displacement of 100 km:

1. Diesel requirements:

Multiply 100 km by 312.4 gal per km-- =31,240

2. Gasoline requirements:

Multiply 100 km by 412.0 gal per km-- =41,200

(*g*) Supply requirements:

1. Diesel—multiply 60 km by 31.24 (10 percent of division consumption per km)---------- =1,874

2. Gasoline—multiply 60 km by 41.20 (10 percent of division consumption per km)---------- =2,472

(*h*) Service requirements:

1. Diesel—multiply 16 km by 312.4 gal per km---------- =4,998

2. Gasoline—multiply 16 km by 412.0 gal per km---------- =6,592

(*i*) Kitchen requirements:

Gasoline—multiply 15 gal by 123 organic kitchens---------- =1,845

(*j*) To account for wastage:

1. Diesel—take 10 percent of (*f*)*1*+(*g*)*1*+(*h*)*1* above---------- =3,811

2. Gasoline—take 10 percent of (*f*)*2*+(*g*)*2*+(*h*)*2*+(*i*) above----- =5,211

4th day

(*k*) Displacement of entire division 10 km (with 8 km cross-country and 2 km on roads):

1. Diesel requirements:

Multiply 2 km (road displacement) by 312.4 per gal km---------- =625

2. Gasoline requirements:

Multiply 2 km (road displacement) by 412.0 gal per km---------- =824

(*l*) Displacement of DISCOM:

1. Diesel requirements:

Multiply 8 km (road displacement) by 19.07 gal per km ..... =153

2. Gasoline requirements:

Multiply 8 km (road displacement) by 24.67 gal per km ..... =197

(*m*) Displacement of combat units:

1. Diesel requirements:

Multiply 8 km (cross-country battle displacement) by 293.35 gal per km (division total less DISCOM total) multiplied by 2.5 for cross-country battle factor (para 5–9*b*(3)) ..... =5,867

2. Gasoline requirements:

Multiply 8 km (cross-country battle displacement) by 387.30 gal per km (division total less DISCOM total) multiplied by 2.5 for cross-country battle factor ..... =7,746

(*n*) Supply requirements:

1. Diesel—multiply 50 km (supply distance) by 31.24 (10 percent of division consumption per km) ..... =1,562

2. Gasoline—multiply 50 km (supply distance) by 41.20 (10 percent of division consumption per km) ..... =2,060

(*o*) Service requirements:

1. Diesel—multiply 16 km by 312.4 gal per km ..... =4,998

2. Gasoline—multiply 16 km by 412.0 gal per km ..... =6,592

(*p*) Kitchen requirements:

Gasoline—multiply 15 gal by 123 organic kitchens ..... =1,845

(*q*) To account for wastage:

1. Diesel—take 10 percent of (*k*)*1*+(*l*)*1*+(*n*)*1*+(*o*)*1* above ..... =734

2. Gasoline—take 10 percent of (*k*)*2*+(*l*)*2*+(*n*)*2*+(*o*)*2*+(*p*) above ..... =1,152

(*r*) Total estimate for 4 days:

1. Diesel—add (*a*)*1*+(*b*)*1* + (*c*)*1* + (*f*)*1* + (*g*)*1* + (*h*)*1* + (*j*)*1* +(*k*)*1* +(*l*)*1* +(*m*)*1* +(*n*)*1* +(*o*)*1* +(*q*)*1* ..... =109,258

2. Gasoline—add (*a*)*2*+(*b*)*2* +(*c*) *2*+(*d*)+(*e*)+(*f*) *2*+(*g*)*2*+(*h*) *2* +(*i*)+(*j*) *2* +(*k*) *2* +(*l*) *2* +(*m*) *2* +(*n*)*2*+(*o*)*2*+(*p*)+(*q*)*2* ..... =154,029

c. Gallons-Per-Man-Per-Day Method of Estimating Petroleum Requirements. The gallons-per-man-per-day method of estimating petroleum requirements is used in the early planning stages when definitive information is not available on the numbers and types of vehicles. Because of the variables in organizational composition, this method is seldom used below field army and never below corps; however, once established for a given theater, the figure may be used for requisitioning purposes by smaller units. It is emphasized that the gallons-per-man-per-day method is to be used as a guide only and not as a substitute for more exacting computation. The consumption in gallons-per-man-per-day in various theaters will necessarily vary with terrain, climate, ratio between land and amphibious operations, and units using special vehicles and equipment. The figures in table 5–21 should be adjusted to fit each particular area as soon as experience shows any variance between these planning factors and actual usage. To compute estimated petroleum requirements, multiply troop strength by factors listed below.

Table 5–21. Army Class III Supplies [a]

	1	2	3
1	Product	Lb per man per day	Gal per man per day
2	Army gnd bulk petrl fuels	50.77	8.05
3	MOGAS	(38.19)	[b](6.25)
4	Diesel	(12.58)	[b] [c](1.80)
5	Eng oil	1.00	[b] 0.10
6	Gear lubs	0.80	[b] 0.08
7	Grease	[a] 0.06	

[a] Class IIIA supply requirements must be individually computed from fuel data for Army aircraft (table 5–12).
[b] Data based on SB 710–2, sec. I, ch 2, for France and Germany.
[c] Data on M60 tanks from consumption rates established during exercises in Europe.

5–9. Fuel Requirements (Field Army Units)

a. Requirements for diesel and gasoline for field army units are tabulated in tables 5–22 through 5–28.

b. Tabulations are governed by the following:

(1) Columns 3 and 4 of each table show the number of gallons of fuel required to move a specific unit 1 kilometer except for Army aircraft. When multifuel equipment is used, diesel consumption is assumed.

Table 5–22. Airborne Division (TOE 57G)—Fuel Data

1	1 Unit	2 TOE	3 Fuel to move 1 km (gal)		5 Fuel cap (gal) Veh tks		7 Gas cans		9 Bulk fuel		11 Total fuel cap		13 Organic kitchens
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
2	HHC	57–4G	0. 06	1. 95	50	658	10	230			60	888	1
3	Avn bn	1–55G	0. 83	2. 44	750	869	150	340	13, 161	9, 139	14, 061	10, 348	2
4	HHC	1–56G	(0. 17)	(1. 27)	(150)	(458)	(30)	(175)	(124)	(376)	(304)	(1, 009)	(0)
5	Airmbl co (lt)	1–57G	(0. 44)	(0. 53)	(400)	(185)	(80)	(75)	(8, 947)	(4, 133)	(9, 427)	(4, 393)	(1)
6	Avn GS co	1–58G	(0. 22)	(0. 64)	(200)	(226)	(40)	(90)	(4, 090)	(4, 630)	(4, 330)	(4, 946)	(1)
7	Engr bn	5–25G	4. 00	9. 34	650	2, 602	70	870	1, 443	3, 417	2, 163	6, 889	4
8	HHC	5–26G	(3. 82)	(3. 55)	(500)	(1, 186)	(40)	(165)	(1, 443)	(3, 417)	(1, 983)	(4, 768)	(1)
9	3 engr co (each)	5–27G	(0. 06)	(1. 93)	(50)	(472)	(10)	(235)			(60)	(707)	(1)
10	Div arty	6–200G	1. 88	21. 34	1, 650	6, 683	330	2, 515		3, 500	1, 980	12, 698	13
11	HHB	6–201G	(0. 17)	(2. 56)	(150)	(929)	(30)	(340)		(500)	(180)	(1, 769)	(1)
12	3 FA bn, 105-mm, towed (each)	6–215G	(0. 57)	(6. 26)	(500)	(1, 918)	(100)	(725)		(1, 000)	(600)	(3, 643)	(4)
13	HQ, H&S btry	6–216G	(0. 39)	(2. 90)	(350)	(772)	(70)	(275)		(1, 000)	(420)	(2, 047)	(1)
14	3 FA btry (each)	6–217G	(0. 06)	(1. 12)	(50)	(382)	(10)	(150)			(60)	(532)	(1)
15	9 abn inf bn (each)	7–35G	0. 44	7. 36	600	1, 379	120	550	702	1, 298	1, 422	3, 227	4
16	HHC	7–36G	(0. 44)	(3. 49)	(600)	(1, 109)	(120)	(415)	(702)	(1, 298)	(1, 422)	(2, 822)	(1)
17	3 rifle co (each)	7–37G		(1. 29)		(90)		(45)				(135)	(1)
18	DISCOM	29–51G	3. 03	12. 96	3, 220	4, 694	540	1, 705	1, 248	2, 532	5, 008	8, 931	10
19	HHC and band	29–52G	(0. 06)	(0. 45)	(50)	(167)	(10)	(55)			(60)	(222)	(1)
20	Med bn	8–65G	(0. 24)	(6. 29)	(200)	(2, 374)	(40)	(840)		(1, 000)	(240)	(4, 214)	(2)
21	HQ and spt co	8–66G	(0. 06)	(2. 00)	(50)	(745)	(10)	(270)		(1, 000)	(60)	(2, 015)	(2)
22	3 med co (each)	8–67G	(0. 06)	(1. 43)	(50)	(543)	(10)	(190)			(60)	(733)	(0)
23	Sup co	10–37G	(0. 22)	(0. 64)	(200)	(245)	(40)	(85)	(1, 248)	(1, 532)	(1, 488)	(1, 862)	(1)
24	QM air equip co	10–337G	(0. 73)	(0. 29)	(680)	(109)	(130)	(35)			(810)	(144)	(1)
25	Admin co	12–157G	(0. 79)	(0. 95)	(1, 190)	(345)	(140)	(125)			(1, 330)	(470)	(2)
26	Maint bn	29–55G	(0. 99)	(4. 34)	(900)	(1, 454)	(180)	(565)			(1, 080)	(2, 019)	(3)
27	HHD	29–56G		(0. 27)		(99)		(35)				(134)	(1)
28	Gnd maint co	29–57G	(0. 33)	(3. 08)	(300)	(1, 078)	(60)	(405)			(360)	(1, 483)	(1)
29	Trans acft maint co	55–99G	(0. 66)	(0. 99)	(600)	(277)	(120)	(125)			(720)	(402)	(1)
30	Sig bn	11–215G	0. 22	6. 99	200	2, 517	40	920	682	998	922	4, 435	3
31	HHC	11–216G	(0. 22)	(0. 79)	(200)	(293)	(40)	(105)	(682)	(998)	(922)	(1, 396)	(1)
32	Sig CO co	11–217G		(3. 00)		(1, 056)		(395)				(1, 451)	(1)
33	Sig spt op co	11–218G		(3. 20)		(1, 168)		(420)				(1, 588)	(1)
34	Armd cav sqdn	17–75G	9. 94	7. 73	850	2, 615	170	865	3, 024	1, 496	4, 044	4, 956	6
35	HHT	17–76G	(0. 50)	(3. 54)	(450)	(1, 044)	(90)	(350)			(540)	(1, 394)	(1)
36	2 armed cav trp (each)	17–77G		(1. 82)		(688)		(220)				(908)	(2)
37	Air cav trp	17–78G	(0. 44)	(0. 55)	(400)	(195)	(80)	(75)	(3, 024)	(1, 476)	(3, 504)	(1, 746)	(1)
38	3 bde HHC (each)	57–42G	0. 06	1. 41	200	326	40	150			240	476	1
39	MP co	19–67G		1. 46		558		170				728	0
40	Total		15. 10	134. 68	13, 370	34, 585	2, 510	13, 015	25, 876	32, 744	41, 756	80, 344	78

*Table 5–23. Airmobile Division (TOE 67T)—Fuel Data**

1	2	3	4	5	6	7	8	9	10	11	12	13
Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								Organic kitchens
				Veh tks		Gas cans		Bulk fuel		Total fuel cap		
		Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
HHC	67–2T	0. 17	1. 71	150	628	30	320			180	948	1
MP co	19–27T		1. 57		562		185				747	1
Avn gp	1–100T	2. 92	13. 70	2, 600	4, 744	520	1, 815	7, 396	9, 404	10, 516	15, 963	18
HHC	1–101T	(0. 11)	(2. 18)	(100)	(793)	(20)	(295)			(120)	(1, 088)	(2)
GS avn co	1–102T	(0. 66)	(0. 99)	(600)	(359)	(120)	(135)	(3, 000)	(1, 818)	(3, 720)	(2, 294)	(2)
2 aslt hel by (each)	1–155T	(0. 90)	(4. 47)	(800)	(1, 488)	(160)	(595)	(1, 664)	(3, 136)	(2, 624)	(5, 219)	(5)
HHC	1–156T	(0. 22)	(0. 94)	(200)	(348)	(40)	(125)			(240)	(473)	(1)
Aerial wpns co	1–157T	(0. 17)	(0. 04)	(150)	(339)	(30)	(140)	(368)	(832)	(548)	(1, 311)	(1)
3 aslt hel co (each)	1–158T	(0. 17)	(0. 83)	(150)	(267)	(30)	(110)	(432)	(768)	(612)	(1, 145)	(1)
Aslt spt hel bn	1–165T	0. 35	(1. 59)	(300)	(616)	(60)	(195)	(1, 068)	(1, 332)	(1, 428)	(2, 143)	(4)
HHC	1–166T	(0. 17)	(0. 48)	(150)	(187)	(30)	(60)	(1, 068)	(1, 332)	(1, 248)	(1, 579)	(1)
3 aslt spt hel co (each)	1–167T	(0. 06)	(0. 37)	(50)	(143)	(10)	(45)			(60)	(188)	(1)
Sig bn	11–205T		3. 79		1, 443		445				1, 888	3
HQ, H&S co	11–206T		(0. 75)		(270)		(100)				(370)	(1)
Co co	11–207T		(3. 04)		(1, 173)		(345)				(1, 518)	(2)
Engr bn	5–215T	0. 06	7. 31	50	2, 825	10	910			60	3, 735	5
HHC	5–216T	(0. 06)	(4. 70)	(50)	(1, 901)	(10)	(550)			(60)	(2, 451)	(2)
3 cbt engr co (each)	5–217T		(0. 87)		(308)		(120)				(428)	(1)
3 bde HHC (each)	67–42T	(0. 06)	1. 59	50	529	10	195	104	1, 096	164	1, 820	2
Cav sqdn	17–95T	0. 83	5. 49	750	1, 935	150	695	2, 484	2, 316	3, 384	4, 946	5
HHT	17–96T	(0. 83)	(1. 96)	(750)	(699)	(150)	(245)	(2, 484)	(2, 316)	(3, 384)	(3, 260)	(1)
3 air cav trp (each)	17–98T		(0. 55)		(180)		(70)				(250)	(1)
Cav trp	17–99T		(1. 88)		(696)		(240)				(936)	(1)
Div arty	6–700T	1. 12	10. 14	1, 000	3, 438	200	1, 285	2, 000	2, 000	3, 200	6, 723	18
HHB	6–701T	(0. 06)	(1. 32)	(50)	(430)	(10)	(160)			(60)	(590)	(1)
Avn btry	6–702T	(0. 11)	(0. 76)	(100)	(252)	(20)	(100)	(500)	(500)	(620)	(852)	(1)
3 FA bn, 105-mm, towed (each).	6–705T	(0. 11)	(1. 94)	(100)		(20)	(240)			(120)	(892)	(4)
HQ, H&S btry	6–706T	(0. 11)	(1. 52)	(100)	(526)	(20)	(195)			(120)	(721)	(1)
3 FA btry (each)	6–707T		(0. 14)		(42)		(15)				(57)	(1)
FA bn, aerial arty	6–725T	(0. 62)	(2. 24)	(550)	(800)	(110)	(305)	(1, 500)	(1, 500)	(2, 160)	(2, 605)	(4)
HQ, H&S btry	6–726T	(0. 11)	(0. 59)	(100)	(215)	(20)	(80)			(120)	(295)	(1)
3 aerial arty btry (each)	6–727T	(0. 17)	(0. 55)	(150)	(195)	(30)	(75)	(500)	(500)	(680)	(770)	(1)
DISCOM	29–41T	3. 23	16. 53	2, 910	5, 339	580	2, 065	6, 037	676, 323	9, 527	727	23
HHC and band	29–42T	(0. 06)	(0. 82)	(50)	(307)	(10)	(105)			(60)	(412)	(1)
Admin co	12–77T	(0. 17)	(0. 59)	(150)	(225)	(30)	(75)			(180)	(300)	(3)

See footnote at end of table.

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Table 5-23. Airmobile Division (TOE 67T)—Fuel Data—Continued*

1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								Organic kitchens
					Veh tks		Gas cans		Bulk fuel		Total fuel cap		
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
1	2		3	4	5	6	7	8	9	10	11	12	13
37	Sup bn	29-95T	(2.32)	(2.13)	(2,110)	(766)	(420)	(290)	(5,225)	(671,135)	(7,755)	(672,191)	(4)
38	HQ, H&S co	29-96T	(1.21)	(0.65)	(1,100)	(239)	(220)	(85)	(5,225)	(1,135)	(6,545)	(1,459)	(1)
39	Sup co	29-97T		(1.21)		(428)		(170)		(670,000)		(670,598)	(2)
40	QM aerial equip spt co	10-67T	(1.11)	(0.27)	(1,010)	(99)	(200)	(35)			(1,210)	(134)	(1)
41	Trans acft maint and sup bn	55-405T	(0.24)	(6.99)	(200)	(2,274)	(40)	(890)	(432)	(4,368)	(672)	(7,532)	(9)
42	HHC	55-406T		(0.67)		(246)		(90)				(336)	(1)
43	4 trans acft maint and sup co (each)	55-407T	(0.06)	(1.58)	(50)	(507)	(10)	(200)	(108)	(1,092)	(168)	(1,799)	(2)
44	Med bn	8-25T	(0.22)	(3.20)	(200)	(872)	(40)	(350)	(380)	(820)	(620)	(2,042)	(4)
45	HQ and spt co	8-26T	(0.22)	(1.04)	(200)	(431)	(40)	(125)	(380)	(820)	(620)	(1,376)	(1)
46	3 med co (each)	8-27T		(0.72)		(147)		(75)				(222)	(1)
47	Maint bn	29-85T	(0.22)	(2.80)	(200)	(895)	(40)	(355)			(240)	(1,250)	(2)
48	HQ and main spt co	29-86T	(0.22)	(1.12)	(200)	(409)	(40)	(145)			(240)	(554)	(2)
49	3 fwd spt det (each)	29-87T		(0.56)		(162)		(70)				(232)	
50	9 inf bn (each)	7-55T		1.63		421		180				601	(5)
51	HHC	7-56T		(0.70)		(180)		(80)				(260)	(1)
52	3 rifle co (each)	7-57T		(0.10)		(16)		(10)				(26)	(1)
53	Cbt spt co	7-58T		(0.63)		(193)		(70)				(263)	(1)
54	Total		8.51	78.05	7,610	25,869	1,520	9,745	18,229	693,331	27,359	728,945	120

*Includes aviation fuel since movement by air is vital to the airmobile division.

Table 5-24. Armored Division Base (TOE 17G)—Fuel Data

1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								Organic kitchens
					Veh tks		Gas cans		Bulk fuel		Total fuel cap		
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
1	2		3	4	5	6	7	8	9	10	11	12	13
2	HHC	17-4G	0.70	3.14	540	1,391	60	295	475	1,225	1,075	2,911	1
3	MP co	19-27G	0.17	2.39	150	909	30	285			180	1,194	2
4	Sig bn	11-35G	4.80	6.74	4,350	2,446	870	920	1,438	962	6,658	4,328	5
5	HHD	11-36G	(0.44)	(0.63)	(400)	(269)	(80)	(85)	(1,438)	(962)	(1,918)	(1,316)	
6	CO co	11-37G	(1.60)	(1.81)	(1,450)	(649)	(290)	(245)			(1,740)	(894)	(2)
7	Fwd comm co	11-38G	(1.27)	(2.56)	(1,150)	(903)	(230)	(355)			(1,380)	(1,258)	(1)
8	Sig spt op co	11-39G	(1.49)	(1.74)	(1,350)	(625)	(270)	(235)			(1,620)	(860)	(2)
9	Engr bn	5-145G	10.72	23.63	5,666	10,223	480	1,140	5,432	13,648	11,578	25,011	7
10	HHC	5-146G	(4.71)	(7.36)	(1,310)	(3,291)	(200)	(450)	(5,432)	(13,648)	(6,942)	(17,389)	(2)

11	4 cbt engr co (each)	5–147G	(1. 28)	(3. 59)	(900)	(1, 515)	(30)	(135)			(930)	(1, 650)	(1)
12	Brg co	5–148G	(0. 89)	(1. 91)	(756)	(872)	(160)	(150)			(916)	(1, 022)	(1)
13	3 bde HHC (each)	17–42G	1. 86	3. 13	1, 320	1, 176	60	190	899	801	2, 279	2, 167	2
14	Armd cav sqdn	17–105G	7. 00	53. 01	5, 230	13, 657	670	380	6, 069	2, 331	17, 259	17, 878	6
15	HHT	17–106G	(4. 86)	(3. 32)	(3, 514)	(1, 349)	(510)	(250)	(6, 069)	(2, 331)	(10, 093)	(3, 930)	(2)
16	3 armd cav trp (each)	17–107G	(0. 47)	(16. 42)	(370)	(4, 045)	(10)	(25)			(380)	(4, 070)	(1)
17	Air cav trp	17–108G	(0. 73)	(0. 43)	(606)	(173)	(130)	(55)	*(5, 290)	*(1, 510)	(6, 026)	(1, 738)	(1)
18	Div arty	6–300G	88. 18	27. 61	37, 724	10, 371	2, 770	3, 150	12, 380	4, 800	52, 874	18, 321	24
19	HHB	6–302G	(0. 84)	(3. 31)	(728)	(1, 177)	(140)	(405)	(380)	(1, 200)	(1, 248)	(2, 782)	(1)
20	3 FA bn, 155-mm, SP (each).	6–365G	(22. 15)	(4. 02)	(9, 258)	(1, 512)	(600)	(540)	(3, 000)	(600)	(12, 858)	(2, 652)	(5)
21	HHB	6–366G	(1. 52)	(2. 05)	(1, 040)	(764)	(40)	(270)			(1, 080)	(1, 034)	(1)
22	3 FA btry (each)	6–367G	(5. 76)	(0. 52)	(1, 944)	(188)	(90)	(70)			(2, 034)	(258)	(1)
23	Svc btry	6–369G	(3. 35)	(0. 41)	(2, 386)	(184)	(290)	(60)	(3, 000)	(600)	(5, 676)	(844)	(1)
24	FA bn, 155-mm/8-in. SP	6–355G	(19. 95)	(5. 32)	(8, 394)	(1, 974)	(670)	(555)	(2, 400)	(1, 200)	(11; 464)	(3, 729)	(5)
25	HQ, H & S btry	6–356G	(2. 73)	(3. 54)	(1, 974)	(1, 309)	(250)	(310)	(2, 400)	(1, 200)	(4, 624)	(2, 819)	(1)
26	3 FA btry, 155-mm, SP (each).	6–357G	(4. 44)	(0. 39)	(1, 314)	(137)	(90)	(55)			(1, 404)	(192)	(1)
27	FA btry, 8-in. SP	6–358G	(3. 90)	(0. 61)	(2, 478)	(254)	(150)	(80)			(2, 628)	(334)	(1)
28	FA bn, HJ	6–175G	(0. 94)	(6. 92)	(828)	(2, 684)	(160)	(570)	(600)	(600)	(1, 588)	(3, 854)	(3)
29	HHB	6–176G	(0. 50)	(1. 96)	(428)	(750)	(80)	(260)	(600)	(600)	(1, 108)	(1, 610)	(1)
30	2 FA btry (each)	6–177G	(0. 22)	(2. 48)	(200)	(967)	(40)	(155)			(240)	(1, 122)	(1)
31	ADA bn, C/V, SP	44–325T	6. 91	5. 61	4, 760	2, 119	740	735	9, 570	3, 930	15, 070	6, 784	5
32	HHB	44–326T	(0. 79)	(1. 13)	(556)	(473)	(120)	(145)	(810)	(690)	(1, 486)	(1, 308)	(1)
33	2 ADA btry, Vulcan, SP (each).	44–327T	(1. 44)	(0. 87)	(982)	(319)	(150)	(115)	(2, 280)	(720)	(3, 412)	(1, 154)	(1)
34	2 ADA btry, Chaparral SP (each).	44–328T	(1. 62)	(1. 37)	(1, 120)	(504)	(160)	(180)	(2, 100)	(900)	(3, 380)	(1, 584)	(1)
35	DISCOM	29–21G	20. 07	26. 54	18, 560	11, 652	3, 590	2, 740	160, 200	35, 348	182, 350	49, 740	19
36	HHC and band	29–2G	(0. 28)	(0. 56)	(250)	(208)	(50)	(70)			(300)	(278)	(1)
37	Admin co	12–37G	(0. 33)	(1. 04)	(300)	(424)	(60)	(130)			(360)	(554)	(3)
38	Med bn	8–35G	(2. 37)	(3. 73)	(2, 150)	(1, 862)	(430)	(730)			(2, 580)	(2, 592)	(4)
39	HQ and spt co	8–36G	(1. 05)	(1. 60)	(950)	(578)	(190)	(220)			(1, 140)	(798)	(1)
40	3 med co (each)	8–37G	(0. 44)	(0. 71)	(400)	(428)	(80)	(170)			(480)	(598)	(1)
41	Maint bn	29–35G	(8. 19)	(17. 59)	(7, 600)	(7, 719)	(1, 460)	(1, 305)	(2, 628)	(2, 620)	(11, 688)	(11, 644)	(7)
42	HQ and main spt co	29–36G	(2. 87)	(7. 25)	(2, 670)	(3, 260)	(510)	(555)	(540)	(660)	(3, 720)	(4, 475)	(3)
43	3 fwd spt co (each)	29–37G	(1. 34)	(3. 07)	(1, 240)	(1, 308)	(240)	(205)	(584)	(616)	(2, 064)	(2, 129)	(1)
44	Trans acft maint co	55–424G	(1. 30)	(1. 13)	(1, 210)	(535)	(230)	(135)	(336)	(112)	(1, 776)	(782)	(1)
45	S&T bn	29–65G	(8. 90)	(3. 62)	(8, 260)	(1, 439)	(1, 590)	(505)	(157, 572)	(32, 728)	(167, 422)	(34, 672)	(4)
46	HHC	29–6G	(0. 17)	(0. 77)	(150)	(280)	(30)	(100)			(180)	(380)	(1)
47	S&S co	10–7G	(1. 16)	(1. 58)	(1, 060)	(592)	(210)	(230)	(47, 500)	(30, 000)	(48, 770)	(30, 822)	(1)
48	TMT co	55–87G	(7. 25)	(0. 57)	(6, 750)	(282)	(1, 290)	(80)	(107, 200)		(115, 240)	(362)	(2)
49	Div avn spt det	1–87G	(0. 32)	(0. 70)	(300)	(285)	(60)	(95)	(2, 872)	(2, 728)	(3, 232)	(3, 108)	
50	Total		144. 13	158. 06	80, 940	56, 296	9, 390	10, 215	198, 261	64, 647	293, 881	732, 668	75

*Not included in totals. Unit bulk capacity of 6,800 gallons used to carry JP–4 fuel for organic helicopters.

Table 5-25. Infantry Division Base (TOE 7G)—Fuel Data

1	1 Unit	2 TOE	3 Fuel to move 1 km (gal) Diesel	4 Fuel to move 1 km (gal) Gas	5 Fuel cap (gal) Veh tks Diesel	6 Fuel cap (gal) Veh tks Gas	7 Fuel cap (gal) Gas cans Diesel	8 Fuel cap (gal) Gas cans Gas	9 Fuel cap (gal) Bulk fuel Diesel	10 Fuel cap (gal) Bulk fuel Gas	11 Fuel cap (gal) Total fuel cap Diesel	12 Fuel cap (gal) Total fuel cap Gas	13 Organic kitchens
2	HHC	7-4G	0. 39	2. 21	350	976	70	270			420	1, 246	1
3	MP co	19-27G	0. 17	2. 39	150	909	30	285			180	1, 194	2
4	Avn bn	1-75G	1. 21	2. 66	1, 100	1, 074	220	360	11, 068	5, 932	12, 388	7, 366	4
5	HHD	1-76G	(0. 11)	(1. 34)	(100)	(570)	(20)	(180)			(120)	(750)	(1)
6	Airmbl co (lt)	1-77G	(0. 55)	(0. 75)	(500)	(283)	(100)	(105)	(6, 508)	(3, 692)	(7, 108)	(4, 080)	(2)
7	Avn GS co	1-78G	(0. 55)	(0. 57)	(500)	(221)	(100)	(75)	(4, 560)	(2, 240)	(5, 160)	(2, 536)	(1)
8	Sig bn	11-35G	4. 80	6. 74	4, 350	2, 446	870	920	1, 438	962	6, 658	4, 328	4
9	HHD	11-36G	(0. 44)	(0. 63)	(400)	(269)	(80)	(85)	(1, 438)	(962)	(1, 918)	(1, 316)	
10	CO co	11-37G	(1. 60)	(1. 81)	(1, 450)	(649)	(290)	(245)			(1, 740)	(894)	(1)
11	Fwd comm co	11-38G	(1. 27)	(2. 56)	(1, 150)	(903)	(230)	(355)			(1, 380)	(1, 258)	(1)
12	Sig spt co	11-39G	(1. 49)	(1. 74)	(1, 350)	(625)	(270)	(235)			(1, 620)	(860)	(2)
13	Engr bn	5-155G	16. 57	10. 49	10, 696	4, 622	1, 670	830	5, 344	5, 000	17, 710	10, 452	7
14	HHC	5-156G	(6. 40)	(4. 46)	(2, 120)	(1, 890)	(350)	(340)	(5, 344)	(5, 000)	(7, 814)	(7, 230)	(2)
15	4 engr co (each)	5-157G	(2. 32)	(1. 03)	(1, 955)	(465)	(290)	(85)			(2, 245)	(550)	(1)
16	Brg co	5-148G	(0. 89)	(1. 91)	(756)	(872)	(160)	(150)			(916)	(1, 022)	(1)
17	3 bde HHC (each)	7-42G	0. 28	1. 94	250	796	50	260		500	300	1, 556	2
18	Armd cav sqdn	17-105G	7. 00	53. 01	5, 230	13, 657	670	380	11, 359	3, 841	17, 259	17, 878	6
19	HHT	17-106G	(4. 86)	(3. 32)	(3, 514)	(1, 349)	(510)	(250)	(6, 069)	(2, 331)	(10, 093)	(3, 930)	(2)
20	3 armd cav trp (each)	17-107G	(0. 47)	(16. 42)	(370)	(4, 045)	(10)	(25)			(380)	(4, 070)	(1)
21	Air cav trp	17-108G	(0. 73)	(0. 43)	(606)	(173)	(130)	(55)	(5, 290)	(1, 510)	(6, 026)	(1, 738)	(1)
22	Div arty	6-100G	18. 65	29. 37	16, 190	11, 326	2, 630	3, 250	5, 180	4, 800	24, 000	19, 376	21
23	HHB	6-302G	(0. 84)	(3. 31)	(728)	(1, 177)	(140)	(405)	(380)	(1, 200)	(1, 248)	(12, 782)	(1)
24	3 FA bn, 105-mm, towed (each)	6-155G	(2. 36)	(4. 93)	(2, 622)	(1, 947)	(540)	(555)	(600)	(600)	(3, 762)	(3, 102)	(4)

25	FA bn, 155-mm/8-in., towed	6-165G	(9.79)	(4.35)	(6,768)	(1,624)	(710)	(610)	(2,400)	(1,200)	(9,878)	(3,434)	(5)
26	HQ, H&S btry	6-166G	(2.26)	(2.24)	(1,734)	(836)	(200)	(320)	(2,400)	(1,200)	(4,334)	(2,356)	(1)
27	3 FA btry, 155-mm, towed (each)	6-167G	(1.21)	(0.50)	(852)	(178)	(120)	(70)			(972)	(248)	(1)
28	FA btry, 8-in. towed	6-358G	(3.90)	(0.61)	(2,478)	(254)	(150)	(80)			(2,628)	(334)	(1)
29	FA bn, HJ	6-175G	(0.94)	(6.92)	(828)	(62,684)	(160)	(570)	(600)	(600)	(1,588)	(3,854)	(3)
30	HHB	6-176G	(0.50)	(1.96)	(428)	750	(80)	(260)	(600)	(600)	(1,108)	(1,610)	(1)
31	2 FA btry, (each)	6-177G	(0.22)	(2.48)	(200)	(967)	(40)	(155)			(240)	(1,122)	(1)
32	ADA bn, C/V, SP	44-325G	6.91	5.61	4,760	2,119	740	735	9,570	3,930	15,070	6,784	5
33	HHB	44-326G	(0.79)	(1.13)	(556)	(473)	(120)	(145)	(810)	(690)	(1,486)	(1,308)	(1)
34	2 ADA btry, Vulcan, SP (each).	44-327G	(1.44)	(0.87)	(982)	(319)	(150)	(115)	(2,280)	(720)	(3,412)	(1,154)	(1)
35	2 ADA btry, Chaparral, SP (each).	44-328G	(1.62)	(1.37)	(1,120)	(504)	(160)	(180)	(2,100)	(900)	(3,380)	(1,584)	(1)
36	DISCOM	29-1G	17.76	21.40	16,420	9,358	3,180	2,280	97,632	35,116	117,456	46,530	16
37	HHC and band	29-2G	(0.28)	(0.56)	(250)	(208)	(50)	(70)			(300)	(278)	(1)
38	Admin co	12-37G	(0.33)	(1.04)	(300)	(424)	(60)	(130)			(360)	(554)	(2)
39	Med bn	8-35G	(2.37)	(3.73)	(2,150)	(1,862)	(430)	(730)			(2,580)	(2,592)	(3)
40	HQ and spt co	8-36G	(1.05)	(1.60)	(950)	(578)	(190)	(220)			(1,140)	(798)	
41	3 med co (each)	8-37G	(0.44)	(0.71)	(400)	(428)	(80)	(170)			(480)	(598)	(1)
42	S&T bn	29-5G	(7.43)	(2.91)	(6,860)	(1,154)	(1,330)	(410)	(95,000)	(32,500)	(103,190)	(34,064)	(4)
43	HHC	29-5G	(0.17)	(0.77)	(150)	(280)	(30)	(100)			(180)	(380)	
44	S&S co	10-7G	(1.16)	(1.58)	(1,060)	(592)	(210)	(230)	(47,500)	(30,000)	(48,770)	(30,822)	(2)
45	TMT co	55-88G	(6.10)	(0.56)	(5,650)	(282)	(1,090)	(80)	(47,500)	(2,500)	(54,240)	(2,862)	(2)
46	Maint bn	29-15G	(7.35)	(13.16)	(6,860)	(5,710)	(1,310)	(940)	(2,632)	(2,616)	(11,026)	(9,042)	(6)
47	HQ and main spt co	29-16G	(2.69)	(4.05)	(2,530)	(1,785)	(480)	(310)	(720)	(480)	(3,730)	(2,575)	(3)
48	3 fwd spt co (each)	29-17G	(1.12)	(2.66)	(1,040)	(1,130)	(200)	(165)	(600)	(600)	(1,840)	(1,895)	(1)
49	Trans acft maint co	55-89G	(1.30)	(1.13)	(1,210)	(535)	(230)	(135)	(112)	(336)	(1,776)	(782)	
50	Total		74.30	139.70	59,996	48,875	10,230	10,090	141,591	61,081	212,041	119,822	72

Table 5–26. (Mechanized) Infantry Division Base (TOE 37G)—Fuel Data

1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								Organic kitchens
					Veh tks		Gas cans		Bulk fuel		Total fuel cap		
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
2	HHC	37–4G	0. 70	3. 13	540	1, 381	60	295	479	1, 221	1, 079	2, 897	2
3	MP co	19–27G	0. 17	2. 39	150	909	30	285			180	1, 194	1
4	Sig bn	11–35G	4. 80	6. 74	4, 350	2, 446	870	920	1, 438	962	6, 658	4, 328	5
5	HHD	11–36G	(0. 44)	(0. 63)	(400)	(269)	(80)	(85)	(1, 438)	(962)	(1, 918)	(1, 316)	
6	CO co	11–37G	(1. 60)	(1. 81)	(1, 450)	(649)	(290)	(245)			(1, 740)	(894)	(2)
7	Fwd comm co	11–38G	(1. 27)	(2. 56)	(1, 150)	(903)	(230)	(355)			(1, 380)	(1, 258)	(1)
8	Sig op co	11–39G	(1. 49)	(1. 74)	(1, 350)	(625)	(270)	(235)			(1, 620)	(860)	(2)
9	Engr bn	5–145G	10. 72	23. 63	5, 666	10, 223	480	1, 140	5, 432	13, 648	11, 578	25, 011	7
10	HHC	5–146G	(4. 71)	(7. 36)	(1, 310)	(3, 291)	(200)	(450)	(5, 432)	(13, 648)	(6, 942)	(17, 389)	(2)
11	4 engr co (each)	5–147G	(1. 28)	(3. 59)	(900)	(1, 515)	(30)	(135)			(930)	(1, 650)	(1)
12	Brg co	5–148G	(0. 89)	(1. 91)	(756)	(872)	(160)	(150)			(916)	(1, 022)	(1)
13	3 bde (each)	37–42G	1. 86	3. 13	1, 340	1, 176	60	190	1, 599	1, 401	2, 999	2, 767	1
14	Armd cav sqdn	17–105G	7. 00	53. 01	5, 230	13, 657	670	380	(6, 060)	2, 331	17, 259	17, 878	6
15	HHT	17–106G	(4. 86)	(3. 32)	(3, 514)	(1, 349)	(510)	(250)	(6, 069)	(2, 331)	(10, 093)	(3, 930)	(2)
16	3 armd cav trp (each)	17–107G	(0. 47)	(16. 42)	(370)	(4, 045)	(10)	(25)			(380)	(4, 070)	(1)
17	Air cav trp	17–108G	(0. 73)	(0. 43)	(606)	(173)	(130)	(55)	*(5, 290)	*(1, 510)	(6, 026)	(1, 738)	(1)
18	Div arty	6–300G	88. 18	27. 61	37, 724	10, 371	2, 770	3, 150	10, 380	4, 800	52, 874	18, 321	24
19	HHB	6–302G	(0. 84)	(3. 31)	(728)	(1, 177)	(140)	(405)	(380)	(1, 200)	(1, 248)	(2, 782)	(1)
20	3 FA bn, 155-mm, SP (each).	6–365G	(22. 15)	(4. 02)	(9, 258)	(1, 512)	(600)	(540)	(3, 000)	(600)	(12, 858)	(2, 652)	(5)
21	HHB	6–366G	(1. 52)	(2. 05)	(1, 040)	(764)	(40)	(270)			(1, 080)	(1, 034)	(1)
22	3 FA btry (each)	6–367G	(5. 76)	(0. 52)	(1, 944)	(188)	(90)	(70)			(2, 034)	(258)	(1)
23	Svc btry	6–369G	(3. 35)	(0. 41)	(2, 386)	(184)	(290)	(60)	(3, 000)	(600)	(5, 676)	(844)	(1)
24	FA bn, 155-mm/8-in., SP.	6–355G	(19. 95)	(5. 32)	(8, 394)	(1, 974)	(670)	(555)	(2, 400)	(1, 200)	(11, 464)	(13, 729)	(5)
25	HQ, H&S btry	6–356G	(2. 73)	(3. 54)	(1, 974)	(1, 309)	(250)	(310)	(2, 400)	(1, 200)	(4, 624)	(2, 819)	(1)
26	3 FA btry, 155-mm, SP (each).	6–357G	(4. 44)	(0. 39)	(1, 314)	(137)	(90)	(55)			(1, 404)	(192)	(1)
27	FA btry, 8-in., SP	6–358G	(3. 90)	(0. 61)	(2, 478)	(254)	(150)	(80)			(2, 628)	(334)	(1)
28	FA bn, HG	6–175G	(0. 94)	(6. 92)	(828)	(2, 684)	(160)	(570)	(600)	(600)	(1, 588)	(3, 854)	(3)
29	HHB	6–176G	(0. 50)	(1. 96)	(428)	(750)	(80)	(260)	(600)	(600)	(1, 108)	(1, 610)	(1)
30	2 FA btry (each)	6–177G	(0. 22)	(2. 48)	(260)	(967)	(40)	(155)			(240)	(1, 122)	(1)
31	ADA bn, C/V, SP	44–325G	6. 91	5. 61	4, 760	2, 119	740	735	9, 570	3, 930	15, 070	6, 784	5
32	HHB	44–326G	(0. 79)	(1. 13)	(566)	(473)	(120)	(145)	(810)	(690)	(1, 486)	(1, 308)	(1)
33	2 ADA btry, Vulcan, SP (each)	44–327G	(1. 44)	(0. 87)	(982)	(319)	(150)	(115)	(2, 280)	(720)	(3, 412)	(1, 154)	(1)
34	2 ADA btry, Chaparral, SP (each)	44–328G	(1. 62)	(1. 37)	(1, 120)	(504)	(160)	(180)	(2, 100)	(900)	(3, 380)	(1, 584)	(1)
35	DISCOM	29–11G	19. 07	24. 67	17, 710	10, 930	3, 350	2, 610	162, 164	36, 096	183, 224	49, 836	16

36	HHC and band	29–2G	(0.28)	(0.56)	(250)	(208)	(50)	(70)			(300)	(278)	(1)
37	Admin co	12–37G	(0.33)	(1.04)	(300)	(424)	(60)	(130)			(360)	(554)	(2)
38	Med bn	8–35G	(2.37)	(3.73)	(2,150)	(1,862)	(430)	(730)			(2,580)	(2,592)	(3)
39	HQ and spt co	8–36G	(1.05)	(1.60)	(950)	(578)	(190)	(220)			(1,140)	(798)	
40	3 med co (each)	8–37G	(0.44)	(0.71)	(400)	(428)	(80)	(170)			(480)	(598)	(1)
41	S&T bn	29–65G	(8.90)	(3.62)	(8,260)	(1,439)	(1,590)	(505)	(157,567)	(32,733)	167,417)	(34,677)	(4)
42	HHC	29–6G	(0.17)	(0.77)	(150)	280)	(30)	(100)			(180)	(380)	
43	S&S co	10–7G	(1.16)	(1.58)	(1,060)	(592)	(210)	(230)	(47,500)	(30,000)	(48,770)	(30,822)	(2)
44	TMT co	55–87G	(7.25)	(0.57)	(6,750)	(282)	(1,290)	(80)	(107,200)		(115,240)	(362)	(2)
45	Div avn spt det	1–87G	(0.32)	(0.70)	(300)	(285)	(60)	(95)	(2,867)	(2,733)	(3,227)	(3,113)	
46	Maint bn	29–25G	(7.19)	(15.72)	(6,750)	(6,997)	(1,220)	(1,175)	(4,597)	(3,563)	(12,567)	(11,735)	(6)
47	HQ and main spt co	29–26G	(2.09)	(6.19)	(1,930)	(2,821)	(290)	(470)	(483)	(717)	(2,703)	(4,008)	(3)
48	3 fwd spt co (each)	29–27G	(1.36)	(2.84)	(1,290)	(1,236)	(250)	(195)	(622)	(578)	(2,162)	(2,009)	(1)
49	Trans acft maint co	55–424G	(1.02)	(1.01)	(950)	(468)	(180)	(120)	(2,248)	(1,112)	(3,378)	(1,700)	
50	Total		143.13	156.18	80,150	55,564	9,150	10,085	202,329	67,391	296,919	134,550	69

*Not included in totals. Unit bulk capacity of 6,800 gallons used to carry JP-4 fuel for organic helicopters.

Table 5–27. Combat Units—Fuel Data

1	1 Unit	2 TOE	3 Fuel to move 1 km (gal)		4 Fuel cap (gal)								13 Organic kitchens
					Veh tks		Gas cans		Bulk fuel		Total fuel cap		
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
	Sep bde base												
2	Sep inf bde	7–100G	24.11	29.03	14,789	11,463	2,570	2,265	75,250	59,730	92,609	73,458	15
3	Sep armd bde	17–100G	21.94	56.52	13,784	18,845	1,890	2,205	36,200	72,400	51,874	93,601	13
4	Sep inf bde (mech)	37–100G	37.91	33.71	20,519	11,451	2,440	2,060	47,000	27,540	69,959	41,051	15
	Inf units												
5	Inf bn, inf div, or sep inf bde	7–15G	1.34	5.45	1,134	2,031	240	705	2,040	4,230	3,378	6,966	6
6	Inf bn (mech), armd div, inf div (mech), sep armd bde, sep inf bde, or sep inf bde (mech).	7–45G	5.61	29.23	4,060	8,299	390	370	4,920	9,550	9,370	18,219	6
7	Inf LRP co	7–157E	0.88	0.35	800	136	160	40	845	155	1,805	331	1
8	Inf sct dog plat	7–167E	0.22	0.04	200	17	40	5			240	23	
9	Inf pfdr plat, abn	7–168E		0.16		58		20				78	
	Armor units												
10	Tk bn, armd div, inf div, inf div (mech), sep armd bde, sep inf bde, or sep inf bde (mech).	17–35G	43.34	17.06	23,856	5,605	650	265	13,850	3,800	38,356	9,670	4
11	Armd cav regt	17–51G	153.39	96.10	55,287	33,685	2,840	1,450	29,200	17,600	87,327	52,735	25

Table 5–28. Combat Support Units—Fuel Data

1	1 Unit	2 TOE	3 Fuel to move 1 km (gal) Diesel	4 Fuel to move 1 km (gal) Gas	5 Fuel cap (gal) Veh tks Diesel	6 Fuel cap (gal) Veh tks Gas	7 Fuel cap (gal) Gas cans Diesel	8 Fuel cap (gal) Gas cans Gas	9 Fuel cap (gal) Bulk fuel Diesel	10 Fuel cap (gal) Bulk fuel Gas	11 Fuel cap (gal) Total fuel cap Diesel	12 Fuel cap (gal) Total fuel cap Gas	13 Organic kitchens
	FA units												
2	HHB, FA gp	6–401G	0.33	2.10	300	732	60	280			360	1,012	1
3	FA bn, 155-mm, towed	6–425G	5.82	3.66	4,170	1,369	610	495	2,400	1,200	7,180	3,064	5
4	HHB	6–426G	(0.17)	(1.97)	(150)	(727)	(30)	(265)			(180)	(992)	(1)
5	3 FA btry (each)	6–427G	(1.33)	(0.41)	(930)	(147)	(130)	(55)			(1,060)	(202)	(1)
6	Svc btry	6–429G	(1.66)	(0.46)	(1,230)	(201)	(190)	(65)	(2,400)	(1,200)	(3,820)	(1,466)	(1)
7	FA bn, 175-mm, SP	6–435G	12.62	3.89	8,334	1,461	570	525	1,800	600	10,704	2,586	5
8	HHB	6–436G	(0.17)	(2.29)	(150)	(840)	(30)	(310)			(180)	(1,150)	(1)
9	3 FA btry (each)	6–437G	(3.44)	(0.38)	(2,202)	(140)	(110)	(50)			(2,312)	(190)	(1)
10	Svc btry	6–439G	(2.13)	(0.46)	(1,578)	(201)	(210)	(65)	(1,800)	(600)	(3,588)	(866)	(1)
11	FA bn, 8-in., SP	6–445G	12.13	6.15	8,080	2,377	580	680	1,800	600	10,460	3,657	5
12	HHB	6–416G	(0.17)	(2.43)	(150)	(888)	(30)	(340)			(180)	(1,228)	(1)
13	3 FA btry (each)	6–447G	(3.53)	(0.67)	(2,302)	(281)	(130)	(85)			(2,432)	(366)	(1)
14	Svc btry	6–449G	(1.37)	(1.71)	(1,024)	(646)	(160)	(85)	(1,800)	(600)	(2,984)	(1,331)	(1)
15	FA bn, 155-mm, SP	6–455G	14.68	3.34	6,992	1,240	500	450	4,200	1,200	11,692	2,890	5
16	HHB	6–456G	(0.66)	(1.93)	(390)	(694)	(30)	(260)			(420)	(954)	(1)
17	3 FA btry (each)	6–457G	(4.02)	(0.34)	(1,710)	(123)	(90)	(45)			(1,800)	(168)	(1)
18	Svc btry	6–459G	(1.96)	(0.39)	(1,472)	(177)	(200)	(55)	(4,200)	(1,200)	(5,872)	(1,432)	(1)
19	FA det HQ tm (AA)	6–500G		0.25		126		40				166	
20	Maint and assy tm, HJ (EA).	6–500G	0.12	0.16	78	74	10	20			88	94	
21	Maint and assy tm, SGT (EB).	6–500G	0.06	0.07	50	24	10	10			60	34	
22	Maint and assy tm, PERSH (EC).	6–500G	0.12	0.07	78	24	10	10			88	34	
23	Maint and assy tm, cannon (ED).	6–500G		0.16		74		20				94	
24	FA scty tm, HJ (FA)	6–500G		0.11		41		15				56	

25	FA scty tm, SGT (FB)	6-500G	----	0.11	----	41	----	15	----			56	----
26	FA scty tm, PERSH (FC)	6-500G	----	0.11	----	41	----	15	----			56	----
27	FA scty tm, cannon (FD)	6-500G	----	0.11	----	41	----	15	----			56	----
28	FA comm tm (GA)	6-500G	----	0.22	----	82	----	30	----			112	----
29	FA med aid sta tm (HA)	6-500G	----	0.14	----	48	----	20	----			68	----
30	FA amb dtl tm (HB)	6-500G	----	0.07	----	24	----	10	----			34	----
31	HHB, corps arty	6-501G	0.66	3.08	600	1,165	120	425	----	600	720	2,190	1
32	HHB, abn corps arty	6-502G	0.33	2.83	300	1,022	60	400	----	600	360	2,022	1
33	FA bn, HJ	6-525G	1.51	9.60	1,306	3,703	250	895	600	1,800	2,156	6,398	4
34	HQ, H&S btry	6-526G	(0.67)	(2.16)	(556)	(829)	(100)	(295)	(600)	(1,800)	(1,256)	(2,924)	(1)
35	3 FA btry (each)	6-527G	(0.28)	(2.48)	(250)	(958)	(50)	(200)	----		(300)	(1,158)	(1)
36	FA bn, SGT	6-555G	3.39	5.82	3,054	2,536	450	800	3,000	2,400	6,504	5,736	3
37	HQ, H&S btry	6-556G	(1.35)	(3.76)	(1,218)	(1,656)	(190)	(500)	(600)	(1,200)	(2,008)	(3,356)	(1)
38	2 FA btry (each)	6-557G	(1.02)	(1.03)	(918)	(440)	(130)	(150)	(1,200)	(600)	(2,248)	(1,190)	(1)
39	FA btry, slt	6-558G	0.17	3.01	150	1,087	30	405	----	600	180	2,092	1
40	FATAB	6-575E	2.23	10.88	2,000	4,303	400	1,435	2,400	4,800	4,800	10,538	4
41	HHB	6-576E	(0.88)	(2.42)	(800)	(979)	(160)	(325)	(2,400)	(4,800)	(3,360)	(6,104)	(1)
42	3 FA btry (each)	6-577E	(0.45)	(2.82)	(400)	(1,108)	(80)	(370)	----		(480)	(1,478)	(1)
43	FA bn, PERSH	6-615D	5.50	33.34	4,786	10,723	780	1,795	5,400	10,800	10,966	23,318	6
44	HHB	6-616D	(0.89)	(3.93)	(778)	(1,117)	(140)	(225)	(600)	(1,200)	(1,518)	(2,542)	(1)
45	4 FA btry (each)	6-617D	(0.61)	(5.24)	(528)	(1,608)	(100)	(240)	(600)	(1,200)	(1,228)	(3,048)	(1)
46	Svc btry	6-619D	(2.17)	(8.45)	(1,896)	(3,174)	(240)	(610)	(2,400)	(4,800)	(4,536)	(8,584)	(1)
	ADA units												
47	HHB, ADA bde	44-2G	0.66	0.67	600	249	120	85	1,059	441	2,220	334	1
48	ADA tgt det	44-8G	0.06	0.27	50	115	10	35	----		60	150	----
49	HHB, ADA gp	44-12G	4.51	0.53	500	201	100	65	1,070	430	2,100	266	----
50	ADA AW bn, SP	44-85G	3.80	23.73	3,282	9,894	610	310	5,885	16,735	9,777	26,939	5
51	HHB	44-86G	(1.6)	(0.81)	(1,282)	(334)	(210)	(110)	(2,521)	(659)	(4,013)	(1,103)	(1)
52	4 ADA btry (each)	44-87G	(0.55)	(5.73)	(500)	(2,390)	(100)	(50)	(841)	(4,019)	(1,441)	(6,459)	(1)
53	ADA bn, HAWK	44-235G	7.83	3.75	7,100	1,553	1,420	515	25,834	5,966	34,354	8,034	5
54	HHB	44-236G	(0.99)	(1.47)	(900)	(585)	(180)	(195)	(3,854)	(2,506)	(4,934)	(3,286)	(1)
55	4 ADA btry (each)	44-237G	(1.71)	(0.57)	(1,550)	(242)	(310)	(80)	(5,495)	(865)	(7,355)	(1,187)	(1)
56	ADA bn, HERC	44-535G	4.36	11.81	3,756	7,050	780	910	18,670	13,490	23,196	21,450	5
57	HHB	44-536G	(2.80)	(10.81)	(2,356)	(6,682)	(500)	(790)	(3,294)	(9,426)	(6,140)	(16,898)	(1)
58	4 ADA btry (each)	44-537G	(0.39)	(0.25)	(350)	(92)	(70)	(30)	(3,844)	(1,016)	(4,264)	(1,138)	(1)

(2) Figures in column 4 do not include fuel requirements of equipment that normally does not move under its own power on long marches, i.e., equipment mounted on vehicles, bulldozers, scoop-type loaders, or forklift trucks.

(3) The number of gallons in columns 3 and 4 are multiplied by a factor of 2.5 for cross-country battle conditions. The 10-percent handling factor (para 5–8) is not applied when the cross-country factor is used.

(4) When a unit is not on the march 4,000 gallons of fuel per division is required for administrative vehicles, kitchens, and gasoline-powered equipment. Daily consumption of gasoline per kitchen is 15 gallons (FM 10–13).

(5) Fuel reserve in vehicles has been computed as two 5-gallon cans per truck, except for ¼-ton trucks and similar small vehicles, which carry one 5-gallon can each, and 2½- and 5-ton wreckers, which carry four 5-gallon cans each.

(6) Columns 9 and 10 represent carrying capacity of all metal tanks, tankers, collapsible containers, and fuel-dispensing vehicles organic to each division. Units authorized helicopters use a portion of their bulk fuel-carrying capacity for class III(A) fuel.

(7) To obtain lubricating oil requirements in gallons, multiply vehicular fuel requirements by a factor of 0.02.

(8) Division tables are based on the engineer bridge company with mobile assault bridging as applicable.

(9) Column 13 was determined at 150 men per kitchen.

Section V. CLASS V SUPPLY

5–10. Ammunition Service

a. Traditionally, ammunition has been considered class V only. Ammunition is now a service, encompassing the supply and maintenance of conventional and special ammunition, the class II and IV items peculiar to ammunition, and the maintenance of guided-missile systems. It also includes the specialized services closely associated with ammunition, e.g., escort, calibration, and disposal. The scope of ammunition service will vary widely with the type of conflict and with the operational environment in which U.S. forces fight. In peacetime ammunition service is primarily a maintenance function. During wartime the tactical arms must fight for protracted periods with the ammunition that is "on the ground." The capability to fight is related directly to the adequacy of planning ammunition stockage levels and the serviceability of these stocks at the beginning of hostilities.

b. Subsequent paragraphs cover the interrelationships of ammunition service and tactics, the factors that govern the establishment and adjustment of ammunition supply levels, and basic information on ammunition supply and maintenance procedures. They should provide an insight into ammunition service and promote understanding among tactical and ammunition service commanders.

c. Tables in this section contain logistic planning data for conventional ammunition pertaining to—

(1) Combat vehicle ammunition data (table 5–29).

(2) Estimated expenditures of ammunition.

(*a*) Ammunition per weapon per day, expressed in rounds (table 5–30).

(*b*) Ammunition per type of unit per day, expressed in STON (table 5–31).

(3) Field artillery ammunition expenditures.

(*a*) Expenditures in rounds per weapon per hour (table 5–32).

(*b*) Expenditures in STON per battalion per hour (table 5–33).

(4) Basic load.

(*a*) Airborne division basic load (table 5–34).

(*b*) Infantry division (mechanized) base (less artillery units) basic load (table 5–35).

(*c*) Armored division weight of basic load (table 5–36).

(*d*) Infantry division weight of basic load (table 5–37).

(*e*) Infantry division (mechanized) weight of basic load (table 5–38).

(*f*) Combat unit basic loads (nondivisional, divisional, and resupply capacity of organic ammunition vehicles) (tables 5–38).

(*g*) Combat support unit basic loads (table 5–40).

(*h*) Combat service support unit basic loads (table 5–42).

(*i*) Combat service support unit basic load summary (table 5–42).

d. FM 101–10–3 contains logistic data on special ammunition. FM 9–6 contains details on supply, maintenance, and other aspects of ammunition services.

e. SB 38–26 contains details on estimated average quantity of ammunition required per day to sustain operations in an active combat theater. AR 11–12 contains details on days of supply authorized oversea commands. These references, together with personnel and weapon densities, establish the level of ammunition reserves authorized during the pre-hostilities phase and must be the basis for tactical planning of initial phases of conflict until resupply can be accomplished.

5–11. Interrelationships of Tactics and Ammunition Service

Ammunition directly influences tactical operations; therefore, tactical commanders must plan their operations and commit their forces with full awareness of the support capabilities of the ammunition service support structure. Likewise, combat service support commanders must establish, stock, and employ ammunition service units with full awareness of the operational plans of the tactical commanders. An imbalance of either tactics or ammunition service may decisively influence operations. Thus, commanders must not consider tactics and ammunition service as individual entities, but as an inseparable unity that requires maximum attention, cooperation, and coordination.

5–12. Ammunition Supply Levels

Levels of ammunition supply are normally expressed as days of supply for each theater of operations and for major commands in each theater. These supply levels are established initially in accordance with references given in paragraph 5–10*e* and special authorization for support of contingency plans. Available ammunition assets are then announced as "available supply rates (ASR)." As tactical experience is gained, the required supply rate (RSR) is computed. The ammunition logistic system relates ammunition (ASR) to the consumption or planned consumption (RSR) so that the desired balance of reserves on hand can be maintained. Therefore, above average consumption by one part of the force tends to be balanced by limiting the consumption of another part of the force. Major commanders will desire to maintain a planned level of supply as the minimum acceptable level of reserves. To change this level of supply by increasing the level of receipts requires a planning leadtime in excess of tactical and operational planning leadtime. Factors that cause this long leadtime are procurement and production, order and shipping time, type and quantity of transportation available, storage space in a theater, physical security forces available to protect shipments and storage areas, and the extent of control over the tactical situation.

5–13. Ammunition Supply at Direct Support and General Support Levels

Ammunition supply in the theater of operations is provided at the direct and general support levels. At both levels, conventional ammunition companies operate ammunition supply points (ASP) for conventional ammunition and special ammunition companies operate special ammunition supply points (SASP) for conventional ammunition. Staff supervision of ammunition supply in major combat service support headquarters is exercised by ammunition service staff personnel included within the staff of the Assistant Chief of Staff (ACofS), Supply, at the headquarters of the theater army support command, supply and maintenance command, field army support command, and corps support brigade. At these headquarters, when an inventory/stock control center is provided that operates under the supervision of the ACofS, Supply, ammunition service personnel in the missile and munitions branch of the center perform supply management. Also, these centers can provide personnel to form a "Special Ammunition Logistical Element (SALE)," to be located in the headquarters (e.g., tactical operations center) of the senior commander concerned to aid in supply and resupply of special ammunition. Detailed information on ammunition service in a theater of operations is contained in FM 9–6.

5–14. Conventional Ammunition Supply System

Conventional ammunition supply in the field army is generally based on a continuous refill system. Tactical units are responsible for maintaining a basic load of ammunition at all times. Replenishment of ammunition expended by units is either concurrent with or in expectation of an immediate requirement. Withdrawals from ASP's are replenished by shipments from the communications zone (COMMZ) or from the combat zone. The theater army commander prescribes stock levels to be maintained in field army ammunition installations and COMMZ depots. A system of credits controls ammunition to the field army, and the field army commander makes suballocations to the corps and the corps commander to the division. The allocation of credits to field armies in COMMZ depots, the timely submission of RSR's, the announcement of ASR's by all commanders, the continuous refill system whereby units maintain their basic loads at prescribed levels, and a system of ammunition reports provide the extent of control that the situation requires. The procedures for supply and stock control of conventional ammunition involve the basic load, the RSR, the ASR, and the functions of ammunition service staff officers as well as staff responsibilities of the G3 (S3) and the G4 (S4). The combat service support system provides the means for timely integration of these control factors. (See FM 9–6 and AR 320–5 for definitions and details.)

5–15. Special Ammunition Supply System

The basic load and automatic resupply system that applies to conventional ammunition is not applicable to special ammunition. Special ammunition service in the field is based on special ammunition stockages, special ammunition loads (SAL), and an allocation system. (AR 320–5 defines these terms.) Commanders receive allocations of special ammunition by specific item for a specific time or a specific action. The special ammunition logistical element (SALE) at theater army, field army, and corps coordinates all special ammunition logistic support matters within each of these headquarters. Commanders prescribe the distribution of available weapons to include ownership, storage units, location, type of weapons, yields, and total numbers. Special Forces receive special ammunition on an as-required basis; once issued, it is considered expended. (See FM 31–21 and FM 31–21A.) The principles of the Army Field Stock Control System (AR 711–16) govern stockage of class II and IV items peculiar to special ammunition. FM 9–6 contains details on special ammunition supply and control.

5–16. Combat Vehicle Ammunition Data

Table 5–29 provides background material for tables 5–30 through 5–33. Table 5–29 breaks out weapons from the principal item, the combat vehicle, and lists the ammunition carried in the typical division, both on the vehicle and in division trains, to support each weapon. Figures in columns 6, 7, and 8 are included in the basic load. Figures in other columns average out in the basic load for the weapon concerned, considering that any one weapon may vary among the different TOE units to which specific basic loads apply.

5–17. Estimated Expenditures of Ammunition

a. Table 5–30 shows estimated rounds of ammunition per weapon per day expected for or attributed to different types of combat. This table and table 5–31 are based on the relationships of types of combat to one another, the rounds available per weapon in the basic loads, the weighting of rounds according to the mission of each division and supporting corps artillery, the units involved in the 1965–70 time frame, and the weapons assigned G-series TOE units. This table does not include consideration of close air support.

b. Table 5–31 shows the STON per day of ammunition used per division or corps artillery battalion, based on the number of rounds computed from table 5–30. The first day's expenditure of ammunition for the grenade launcher and recoilless rifles equals the basic load. This table does not include consideration of close air support.

5–18. Field Artillery Ammunition Expenditures

a. Table 5–32 shows the average rate of expenditure per weapon per hour of various types of artillery rounds in division and corps units. Figures in column 6 represent the support of ground divisional and nondivisional maneuver units.

Table 5–29. Combat Vehicle Ammunition Data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		Armt			Misc stowage			Rd per veh				Ammo						
												Ammo stowage (rd per veh)				Rd per veh in tns		
1 Line item number	Cht veh	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Mg cal .50	Gren per veh	Flares sig, gnd, per veh	Misc per veh	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Smg cal .45	Mg cal .50	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Smg cal .45	Mg cal .50	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Mg cal .50
2 A90117	Armt suhsys, hel, 7.62-mm, M23.	----	2						4,200				1,200				3,000	
3 A90154	Armt subsys, hel, 7.62-mm, XM27.	----	1						4,500				1,500				3,000	
4 A90186	Armt suhsys, hel, 7.62-mm, twin, M2.	----	2						6,500				1,300				5,200	
5 A90323	Armt subsys, hel, 7.62-mm, quad, M6.	----	4						21,600				7,200				14,400	
6 A90426	Armt subsys, hel, 7.62-mm/2.75-in., M21.	2.75-in. RL	1					42	21,000			14	6,000			28	15,000	
7 A90460	Armt subsys, hel, 40-mm, M5.	40-mm GL						321				107				214		
8 A90597	Armt subsys, hel, 2.75-in., XM3.	2.75-in. RL						192				48				144		
9 A90871	Armt subsys, hel, GM, M22.	GM lchr						36				6				30		
10 D10725	Carr, 81-mm mort, full-tracked, M125A1:	81-mm mort		1	12			155			2,000	120			600	35		1,400
11 D10740	Carr, 107-mm mort, SP, M106A1.	107-mm mort.	1	1	12 hand			163		180	2,000	93	3,000	180	600	70		1,400
12 D11401	Carr, comd and recon, armd, M114.	----	1	1	20	12			3,520		1,400		2,640		1,000		880	400
13 D12086	Carr, pers, full-tracked, armd, M113A1.	----		1						180	1,800			180	1,800			
14 D12086	Carr, pers, full-tracked armd, M113.	----		1	20 hand	12				180	2,100			180	2,100			
15 E56577	CEV, full-tracked, M728	165-mm DM1 gun	1	1	8	10		30	3,410		735	30	3,410		735			
16 J96819	Gun, antiaircraft arty, SP, 40-mm, M42A1.	40-mm gun (twin).	1		8 hand		66-mm rkt, 4 rd	720	2,000			480	1,750			240	250	
17 J96956	Gun, at, SP, 90-mm M56	90-mm gun			8 hand			29				29						
18 J97230	Gun, FA, SP, 175-mm, M107.	175-mm gun.	----		8	10		114				2				112		
19 K56981	How, hv, SP, 8-in, M110	8-in how			8 hand	10		100				2			500	98		
20 K57255	How, lt, SP, 105-mm, M108.	105-mm how.	----	1	8 smoke or frag.			250			1,100	87			900	163		200
21 K57666	How, mdm, SP, 155-mm, M109.	155-mm, how.	----	1	8 hand	10	66-mm rkt, 10 rd.	150			600	28			500	122		100
22 R50543	Recov veh, full-tracked, lt, armd, M578.	----		1	8	16					600				500			100
23 R50680	Recov veh, full-tracked, mdm, M88.	----		1	8 hand	16	3.5-in rkt, 10 rd.			180	1,600			180	1,500			100

Table 5-29. Combat Vehicle Ammunition Data—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
			Armt			Misc stowage		Rd per veh				Ammo						
												Ammo stowage (rd per veh)				Rd per veh in tns		
1	Line item number	Cbt veh	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Mg cal .50	Gren per veh	Flares sig, gnd, per veh	Misc per veh	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Smg cal .45	Mg cal .50	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Smg cal .45	Mg cal .50	Prin wpn	Mg cal .30/ 7.62-mm, lt flex M60	Mg cal .50
24	V12826	Tk, cbt, full-tracked, 76-mm gun, M41A3.	76-mm gun	1	1	8 hand	12	.....	70	6,000	180	700	65	5,000	180	620	5	1,000	100
25	V12963	Tk, cbt, full-tracked, 90-mm gun, M48A2.	90-mm gun	1	1	8 hand	12	.....	62	5,940	360	630	62	5,940	360	630	.....	.....	.....
26	V13100	Tk, cbt, full-tracked, 105-mm gun, M60A1.	105-mm gun	1	1	8 hand	12	.....	78	6,500	360	1,260	63	5,000	360	900	15	1,500	360
27	V13237	Tk, cbt, full-tracked, 120-mm gun, M103A2.	120-mm gun	2	1	.....	.....	.....	43	8,850	300	525	38	5,240	300	1,000	5	3,610	.....

Table 5-30. Ammunition Per Weapon Per Day, Expressed in Rounds

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Type of combat												
		Attack of position					Defense of position							
		Permanent fortifications		Deliberately organized										
1	Weapon	First day	Succeeding days	First days	Succeeding days	Hastily organized	Covering and security force action	First day	Succeeding days	Inactive Situation	Meeting engagement	Pursuit	Retirement or delaying action	Assault of hostile shore	Protracted period
2	Armt subsys, hel, 7.62-mm, M2	1,083	650	1,083	591	788	650	1,300	788	263	650	135	464	788	329
3	Armt subsys, hel, 40-mm, M5	267	161	267	146	195	161	321	195	65	161	33	115	195	81
4	Armt subsys, hel-M lchr, M22	30	18	30	16	22	18	36	22	7	18	4	13	22	9
5	Armt subsys, hel, 7.62-mm, M23	700	420	700	382	509	420	840	509	170	420	87	300	509	213
6	Armt, subsys, hel, 7.62-mm, XM27	750	450	750	409	545	450	900	545	182	450	93	321	545	228
7	Guidance and launching sta (entac)	13	8	13	7	9	8	15	9	3	8	2	5	9	4
8	Gun, mach, cal .50	219	132	219	120	159	132	263	159	53	132	27	94	159	67
9	Gun, mach, 7.62-mm	541	325	541	295	393	325	649	393	131	325	67	232	393	164
10	Gun, 175-mm, SP	95	57	95	52	69	0	114	69	23	57	0	0	69	29

11	Gun, submachine, cal .45	37	22	37	20	27	22	44	27	9	22	5	16	27	11
12	How, 105-mm, towed or SP	167	100	167	91	121	100	200	121	40	100	21	71	121	51
13	How, 155-mm, towed or SP	192	116	192	105	140	114	231	140	47	116	24	82	140	58
14	How, 8-in., towed or SP	119	72	119	65	87	72	143	87	29	72	0	0	87	36
15	Lchr, gren, 40-mm	27	16	27	15	19	16	32	19	6	16	3	11	19	8
16	Lchr, rkt, 7.62-mm	5	3	5	3	4	3	6	4	1	3	1	2	4	2
17	Mort, 81-mm	121	73	121	66	88	73	145	88	29	73	15	52	88	37
18	Mort, 107-mm	136	82	136	74	99	82	163	99	33	82	17	58	99	41
19	Pistol, cal .45, auto	3	2	3	2	2	2	4	2	1	2		1	2	1
20	Rifle, 5.56-mm	124	74	124	67	90	74	148	90	30	74	15	53	90	38
21	Rifle, 7.62-mm	47	29	47	26	35	29	57	35	12	29	6	20	35	14
22	Rifle, 7.62-mm, auto, with bipod	112	67	112	61	81	67	134	81	27	67	14	48	81	34
23	Rifle, rcl, 90-mm	15	9	15	8	11	9	18	11	4	9	2	6	11	5
24	Rifle, rcl, 106-mm	33	20	33	18	24	20	40	24	8	20	4	14	24	10
25	Tk, cbt, full-tracked, 76-mm gun	58	35	58	32	42	35	70	42	14	35	7	25	42	18
26	Tk, cbt, full-tracked, 90-mm gun	52	31	52	28	38	31	62	38	13	31	7	22	38	16
27	Tk, cbt, full-tracked, 105mm gun	65	39	65	35	47	39	78	47	16	39	8	28	47	20

Table 5–31. Ammunition Per Type of Unit Per Day, Expressed in STON

1	1	2	3	5	5	6	7	8	9	10	11	12	13	14	15
		Type of combat													
		Attack of position						Defense of position							
1	Unit	Permanent fortifications		Deliberately organized		Hastily organized	Covering and security force action	First day	Succeeding days	Inactive situation	Meeting engagement	Pursuit	Retirement or delaying action	Assault of hostile shore	Protracted period
		First day	Succeeding days	First day	Succeeding days										
2	Abn div	676	406	649	369	491	345	811	491	162	406	89	280	491	205
3	Armd div	2,145	1,287	2,059	1,170	1,560	1,095	2,574	1,560	515	1,287	281	888	1,560	651
4	Inf div	1,262	758	1,212	689	918	645	1,515	918	303	758	165	522	918	383
5	Inf div (mech)	1,817	1,090	1,744	991	1,321	928	2,180	1,321	436	1,090	238	752	1,321	552
6	Corps arty, 155-mm bn	200	120	192	109	145	102	240	145	48	120	26	83	145	61
7	Corps arty, 8-in. bn	171	103	164	93	124	0	205	124	41	103	0	0	124	52
8	Corps arty, 175-mm bn	98	59	94	54	72	0	118	72	24	59	0	0	72	30
9	Corps arty, HJ bn	99	60	95	54	72	51	119	72	24	60	13	41	72	30

Table 5–32. Expenditures in Rounds Per Weapon Per Hour

1	Kind of fire or phase of action	2	3	4	5	6
		Average rate per weapon per hour				
		105-mm	155-mm	175-mm	8-in.	HJ
2	Advance guard action, development, and deployment	25	12	8	8	0. 125
3	Preparation	80	25	28	25	0. 75
	Supporting fires during the attack (including counterbattery):					
4	First 2 hours	50	25	28	25	0. 5
5	After 2 hours	30	15	17	15	0. 125
6	Exploitation, pursuit, delaying action, or delaying enemy development	25	12	16	12	0. 5
7	Counterpreparation	60	25	28	25	0. 125
8	Defensive fires against infantry attack (including counterbattery)	50	25	28	25	0. 5
9	Fortified position	50	25	28	25	0. 125

b. Table 5–33 shows the STON expended per hour by division and corps artillery battalions. The figures in columns 2, 3, and 5 are derived from World War II experience and will require modification to fit current weapons and tactics. Figures in column 6 represent the support of ground divisional and nondivisional maneuver units.

5–19. Ammunition Basic Load Data

a. Tables 5–34 through 5–41 are arranged by divisions and selected supporting units listed in paragraph 4–2 in order as follows:

(1) Complete basic load for major units in the airborne and infantry (mechanized) divisions (tables 5–34 and 5–35, respectively).

(2) Weight of basic load per major units in the armored, infantry, and infantry (mechanized) divisions (tables 5–36, 5–37, and 5–38, respectively).

(3) Complete basic load for selected nondivisional combat units (table 5–39), combat support units (table 5–40), and combat service support units (table 5–41).

b. Table 5–42 summarizes basic load data for combat service support units.

Table 5–33. Expenditures in STON Per Battalion Per Hour

1	Kind of fire or phase of action	2	3	4	5	6
		Average rate per weapon per hour				
		105-mm	155-mm	175-mm	8-in.	HJ
2	Advance guard action, development, and deployment	11. 02	12. 35	9. 96	9. 96	2. 25
3	Preparation	35. 28	25. 87	35. 37	33. 78	13. 50
	Supporting fires during the attack (including counterbattery):					
4	First 2 hours	22. 05	25. 87	35. 37	33. 78	9. 00
5	After 2 hours	13. 22	15. 52	21. 55	20. 00	2. 25
6	Exploitation, pursuit, delaying action, or delaying enemy development	11. 02	12. 52	20. 24	16. 17	9. 00
7	Counterpreparation	26. 46	25. 87	35. 37	33. 78	2. 25
8	Defensive fires against infantry attack (including counterbattery)	22. 05	25. 87	35. 37	33. 78	9. 00

Table 5–34. Airborne Division (TOE 57G)—Basic Load of Ammunition

1	Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	HHC (TOE 57–4G)											
2	Gren, hand, frag		2. 125		136	136	289					289
3	Gren, hand, incd		2. 94		85			68	199	17	49	248
4	Gren, hand, smoke, colored		1. 36		32					32	43	43
5	Gren, hand, smoke, HC		2. 56		8					8	20	20
6	Pistol, cal .45	21	0. 056	28	588	21	32					32
7	Rifle, 5.56-mm, with bipod	740	0. 042	114	84, 360	140	670	360	1, 723	240	1, 149	3, 542
8	Total wt											4, 174
9	STON											2. 1
	Avn bn (TOE 1–55G)											
10	Armt subsys, 40-mm, M5	321	1. 06	6	1, 926			107	680	214	1, 361	2, 041
11	Armt subsys, 7.62-mm, M21	21, 000	0. 093	6	126, 000			6, 000	3, 348	15, 000	8, 370	11, 718
12	Armt subsys, 2.75-in., M21	42	27. 00	6	252			14	2, 268	28	4, 536	6, 804
13	Armt subsys, 7.62-mm, M23	4, 200	0. 093	25	105, 000			1, 200	2, 790	3, 000	6, 975	9, 765
14	Flare, sur, trip		1. 94		405			370	717	35	67	784
15	Gren, hand, frag		2. 125		353	353	750					750
16	Gren, hand, incd		2. 94		242			234	687	8	23	710
17	Gren, hand, smoke, colored		1. 36		244			148	201	96	130	331
18	Gren, hand, smoke, HC		2. 56		196			148	378	48	122	500
19	Mine, M14		0. 49		24					24	11	11
20	Mine, M16		11. 20		12					12	134	134
21	Mine, M21		22. 70		35					35	794	794
22	Pistol, pyrotechnic	48	0. 63	1	48			48	30			30
23	Revolver, cal .38	18	0. 038	148	2, 664	18	101					101
24	Rifle, 5.56-mm, with bipod	740	0. 042	205	151, 700	140	1, 205	360	3, 099	240	2, 066	6, 370
25	Starter, fire, NP3		0. 07		16					16	1	1
26	Total wt											40, 844
27	STON											20. 4
	Engr bn (TOE 5–25G)											
28	Dml set, explo, initiating, elec and semi-elec			27							6, 343	6, 343
29	Flare, sur, trip		1. 94		58			58	112			112
30	Gren, hand, frag		2. 125		578	578	1, 228					1, 228
31	Gren, hand, incd		2. 94		390			326	958	64	188	1, 146
32	Gren, hand, smoke, colored		1. 36		128					128	174	174
33	Gren, hand, smoke, HC		2. 56		192					192	491	491

Table 5–34. Airborne Division (TOE 57G)—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	Eng bn (TOE 5–25G)—Continued											
34	Gun, mach, 7.62-mm	3,080	0.093	17	52,360	880	1,391	880	1,391	1,320	2,086	4,868
35	Lchr, gren, 40-mm	30	0.75	71	2,130	6	319	6	319	18	958	1,596
36	Mine, M14		0.49		39			39	19			19
37	Mine, M16		11.20		60			20	224	40	448	672
38	Mine, M18		6.80		15					15	102	102
39	Mine, M21		22.70		100					100	2,270	2,270
40	Pistol, cal .45	21	0.056	98	2,058	21	115					115
41	Rifle, 5.56-mm, with bipod	740	0.042	479	354,460	140	2,816	360	7,242	240	4,828	14,886
42	Rkt, 66-mm, M72		7.80		264	88	686	176	1,372			2,058
43	Smokepot, fltg, SGF2		37.00		6					6	222	222
44	Smokepot, HC		54.00		10					10	540	540
45	Total wt											36,842
46	STON											18.4
	HHB, div arty (6–201G)											
47	Flare, sur, trip		1.94		21			21	41			41
48	Gren, hand, frag		2.125		205	205	435					435
49	Gren, hand, incd		2.94		284			284	835			835
50	Gren, hand, smoke, colored		1.36		76			76	103			103
51	Gren, hand, smoke, HC		2.56		8			8	20			20
52	Gun, mach, 7.62-mm	1,760	0.093	9	15,840	880	737	880	737			1,474
53	Lchr, gren, 40-mm	26	0.75	6	156	8	36	18	81			117
54	Pistol, cal .45	21	0.056	22	462	21	26					26
55	Revolver, cal .38	50	0.038	16	800	50	30					30
56	Rifle, 5.56-mm, with bipod	340	0.042	165	56,100	140	970	200	1,386			2,356
57	Rkt, 66-mm, M72		7.80		22	7	55	15	117			172
58	Mine, M18A1		8.83		10			10	88			88
59	Mine, M19		36.00		20			20	720			720
60	Smokepot, HC		54.00		6			6	324			324
61	Total wt											6,741
62	STON											3.4
	FA bn, 105-mm, towed (6–215G)											
63	Flare, sur, trip		1.94		48			24	47	24	47	94
64	GM sys, intcp, aerial XM41E1		29.30		9	3	88	6	176			264
65	Gren, hand, frag		2.125		475	475	1,009					1,009
66	Gren, hand, incd		2.94		442			442	1,299			1,299

67	Gren, hand, smoke, colored		1.36		128			64	87	64	87	174
68	Gren, hand, smoke, HC		2.56		32			32	82			82
69	Gun, mach, 7.62-mm	2,640	0.093	20	52,800	880	1,637	880	1,637	880	1,637	4,911
70	How, 105-mm, towed	190	65.00	18	3,420			40	46,800	150	175,500	222,300
71	Lchr, gren, 40-mm	26	0.75	18	468	8	108	18	243			351
72	Pistol, cal .45	21	0.056	40	840	21	47					47
73	Rifle, 5.56-mm, with bipod	340	0.042	435	147,900	140	2,558	200	3,654			6,212
74	Rkt, 66-mm, M72		7.80		96	36	281	60	468			749
75	Mine, M18A1		8.83		30			30	265			265
76	Mine, M19		36.00		48			48	1,728			1,728
77	Smokepot, HC		54.00		24			24	1,296			1,296
78	Total wt											240,781
79	STON											120.4
	Inf bn (TOE 7-35G)											
80	Burster, fld, incd		2.50		40					40	100	100
81	Dml set, explo, initiating, elec and semielec			3					704			704
82	Flare, sur, trip		1.94		81			81	157			157
83	GM sys, intcp, aerial, XM41E1		29.30		12	3	88	9	263			351
84	Gren, hand and rifle, smoke, WP		2.60		144	144	374					374
85	Gren, hand, frag		2.125		809	809	1,719					1,719
86	Gren, hand, incd		2.94		269	18	52	216	635	35	102	789
87	Gren, hand, smoke, colored		1.36		176	36	48			140	190	238
88	Gren, hand, smoke, HC		2.56		192			192	491			491
89	Gun, mach, cal .50	630	0.395	7	4,410			420	1,161	210	580	1,741
90	Gun, mach, 7.62-mm	3,080	0.093	24	73,920	880	1,964	1,320	2,946	880	1,964	6,874
91	Lchr, gren, 40-mm	30	0.75	85	2,550	18	1,147	6	382	6	382	1,911
92	Mine, M14		0.49		54			27	13	27	13	26
93	Mine, M16		11.20		27			27	302			302
94	Mine, M21		22.70		81					81	1,838	1,838
95	Mort, 81-mm	120	17.32	9	1,080			80	12,470	40	6,235	18,705
96	Fuze, proximity		3.84		216			12	414	12	414	828
97	Fuze, pt-detonating		3.25		108			12	351			351
98	Mort, 4.2-in	160	40.00	4	640			24	3,840	136	21,760	25,600
99	Fuze, proximity		3.84		180							691
100	Fuze, pt-detonating		3.25		45							146
101	Pistol, cal .45	21	0.056	248	5,208	21	291					291
102	Rifle, 5.56-mm, with bipod	740	0.042	561	415,140	140	3,298	360	8,842	240	5,654	17,794
103	Rifle, cal .50, spotting	220	0.331	12	2,640			110	436	110	436	872
104	Rifle, 106-mm	40	60.50	12	480			12	8,712	28	20,328	29,040
105	Rkt, 66-mm, M72		7.80		216	72	561	144	1,123			1,684
106	Smokepot, HC		54.00		18					18	972	972
107	Total wt											114,589
108	STON											57.2

Table 5–34. Airborne Division (TOE 57G)—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv Rd per wpn	7 Carried on indiv Total wt (lb)	8 Carried on veh Rd per wpn	9 Carried on veh Total wt (lb)	10 Bulk loaded Rd per wpn	11 Bulk loaded Total wt (lb)	12 Total wt (lb)
	HHC and band, DISCOM (TOE 29–52G)											
109	Gren, hand, frag		2.125		125	125	265					265
110	Gren, hand, incd		2.94		23			20	58	3	8	66
111	Gren, hand, smoke, colored		1.36		32					32	43	43
112	Gren, hand, smoke, HC		2.56		8					8	20	20
113	Gun, mach, 7.62-mm	1,760	0.093	2	3,520	880	163	880	163			326
114	Lchr, gren, 40-mm	10	0.75	2	20			5	7	5	7	14
115	Pistol, cal .45	21	0.056	11	231	21	12					12
116	Rifle, 5.56-mm, with bipod	740	0.042	112	82,880	140	658	360	1,693	240	1,128	3,479
117	Rkt, 66-mm, M72		7.80		3	3	23					23
118	Total wt											4,248
119	STON											2.1
	Med bn (TOE 8–65G)											
120	Gren, hand, frag		2.125	341		341	724					724
121	Gren, hand, incd		2.94		240			226	664	14	41	705
122	Gren, hand, smoke, colored		1.36		128					128	174	174
123	Gren, hand, smoke, HC		2.56		32					32	81	81
124	Pistol, cal .45	21	0.056	23	483	21	27					27
125	Rifle, 5.56-mm, with bipod	740	0.042	318	235,320	140	1,869	360	4,808	240	3,205	9,882
126	Total wt											11,593
127	STON											5.8
	Sup co (TOE 10–37G)											
128	Dml set, explo, initiating, elec and semi elec.			1							234	234
129	Gren, hand, frag		2.125		100	100	212					212
130	Gren, hand, incd		2.94		39			38	111	1	2	113
131	Gren, hand, smoke, colored		1.36		32					32	43	43
132	Gren, hand, smoke, HC		2.56		8					8	20	20
133	Gun, mach, 7.62-mm	1,760	0.093	6	10,560	880	491	880	491			982
134	Pistol, cal .45	21	0.056	1	21	21	1					1
135	Rifle, 5.56-mm, with bipod	740	0.042	99	73,260	140	582	360	1,496	240	997	3,075
136	Rkt, 66-mm, M72		7.80		12	4	31	8	62			93
137	Total wt											4,773
138	STON											2.4

QM air equip spt co (TOE 10-337G)

139	Gren, hand, frag		2.125		232	232	493					493
140	Gren, hand, incd		2.94		57			56	164	1	2	166
141	Gren, hand, smoke, colored		1.36		32					32	43	43
142	Gren, hand, smoke, HC		2.56		8					8	20	20
143	Pistol, cal .45	21	0.056	2	42	21	2					2
144	Rifle, 5.56-mm, with bipod	740	0.042	230	170,200	140	1,352	360	3,477	240	2,318	7,147
145	Rkt, 66-mm, M72		7.80		3	3	23					23
146	Total wt											7,894
147	STON											3.9

Admin co (TOE 12-157G)

148	Gren, hand, frag		2.125		352	352	748					748
149	Gren, hand, incd		2.94		81			54	158	27	79	237
150	Gren, hand, smoke, colored		1.36		32					32	43	43
151	Gren, hand, smoke, HC		2.56		8					8	20	20
152	Gun, mach, cal .50	525	0.395	8	4,200			210	663	315	995	1,658
153	Gun, mach, 7.62-mm	1,760	0.093	15	26,400	880	1,227	880	1,227			2,454
154	Pistol, cal .45	21	0.056	16	336	21	18					18
155	Rifle, 5.56-mm, with bipod	740	0.042	337	249,380	140	1,981	360	5,095	240	3,396	10,472
156	Rkt, 66-mm, M72		7.80		27	9	70	18	140			210
157	Total wt											15,860
158	STON											7.9

Maint bn (TOE 29-55G)

159	Armt subsys, 7.62-mm M23	4,200	0.093	2	8,400			1,200	223	3,000	558	781
160	Flare, sur, trip		1.94		20			20	38			38
161	Gren, hand, frag		2.125		486	486	1,032					1,032
162	Gren, hand, incd		2.94		153			150	441	3	8	449
163	Gren, hand, smoke, colored		1.36		72			8	10	64	87	97
164	Gren, hand, smoke, HC		2.56		20			4	10	16	40	50
165	Gun, mach, 7.62-mm	1,760	0.093	6	10,560	880	491	880	491			982
166	Pistol, cal .45	21	0.056	4	84	21	4					4
167	Revolver, cal .38	18	0.038	11	198	18	7					7
168	Rifle, 5.56-mm, with bipod	740	0.042	471	348,540	140	2,769	360	7,121	240	4,747	14,637
169	Rkt, 66-mm, M72		7.80		15	5	39	10	78			117
170	Total wt											18,194
171	STON											9.1

Table 5-34. Airborne Division (TOE 57G)—Basic Load of Ammunition—Continued

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type of munition	Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indiv		Carried on veh		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	Sig bn (TOE 11-215G)											
172	Flare, sur, trip		1.94		22					22	42	42
173	Gren, hand, frag		2.125		549	549	1,166					1,166
174	Gren, hand, incd		2.94		348			254	746	94	276	1,022
175	Gren, hand, smoke, colored		1.36		96					96	130	130
176	Gren, hand, smoke, HC		2.56		64					64	163	163
177	Gun, mach, 7.62-mm	2,640	0.093	1	4,400	880	163	880	163	880	81	407
178	Lchr, gren, 40-mm	30	0.75	4	120	5	56	5	56	20	60	172
179	Mine, M14		0.49		15					15	7	7
180	Mine, M16		11.20		7					7	78	78
181	Mine, M21		22.70		22					22	499	499
182	Pistol, cal .45	21	0.056	23	483	21	27					27
183	Rifle, 5.56-mm, with bipod	740	0.042	526	389,240	140	3,092	360	7,953	240	5,302	16,347
184	Rkt, 66-mm, M72		7.80		66	22	171	44	343			514
185	Total wt											20,574
186	STON											10.3
	Armd cav sqdn (TOE 17-75G)											
187	Armt subsys, 40-mm, M5	321	1.06	7	2,247			107	793	214	1,587	2,380
188	Armt subsys, 7.62-mm, M21	21,000	0.093	7	147,000			6,000	3,906	15,000	9,765	13,671
189	Armt subsys, 2.75-in., M21	42	27.00	7	294			14	2,646	28	5,292	7,938
190	Armt subsys, GM lchr, M22	36	112.00	4	144			6	2,688	30	13,440	16,128
191	Bolt, explo	36	3.316	4	144			6	79	30	397	476
192	Armt subsys, 7.62-mm, M23	4,200	0.093	6	25,200			1,200	669	3,000	1,674	2,343
193	Armt subsys, 7.62-mm, XM27	4,500	0.093	9	40,500			1,500	1,255	3,000	2,511	3,766
194	Dml set, explo, initiating, nonelec			6					456		456	912
195	Flare, sur, trip		1.94		323			323	626			626
196	GM sys, intcp, aerial, XM41E1		29.30		12	3	88	9	263			351
197	Gren, hand and rifle, smoke, WP		2.60		48			48	125			125
198	Gren, hand, frag		2.125		632	632	1,343					1,343
199	Gren, hand, incd		2.94		412			394	1,158	18	53	1,211
200	Green, hand, smoke, colored		1.36		248					248	337	337
201	Gren, hand, smoke, HC		2.56		244			52	133	192	491	624
202	Gun, mach, cal .50	630	0.395	11	6,930			420	1,824	210	912	2,736
203	Gun, mach, 7.62-mm	3,080	0.093	42	129,360			2,200	8,593	880	3,437	12,030
204	Lchr, gren, 40-mm	30	0.75	59	1,770	18	797	6	265	6	265	1,327
205	Mine, M14		0.49		42					42	20	20
206	Mine, M16		11.20		21					21	235	235
207	Mine, M21		22.70		63					63	1,430	1,430

208	Mort, 81-mm	120	17.32	6	720			80	8,313	40	4,156	12,469
209	Pistol, cal .45	21	0.056	115	2,415	21	135					135
210	Revolver, cal .38	18	0.038	78	1,404	18	53					53
211	Rifle, cal .50, spotter	220	0.331	12	2,640			88	349	132	524	873
212	Rifle, 106-mm	40	60.50	12	480			16	11,616	24	17,424	29,040
213	Rifle, 5.56-mm, with bipod	740	0.042	439	324,860	140	2,581	360	6,638	240	4,426	13,645
214	Total wt											126,224
215	STON											63.1
	HHC, bde (TOE 57-42G)											
216	Flamethrower, ptbl			1							20	20
217	Flare, sur, trip		1.94		227			210	407	17	32	439
218	Gren, hand and rifle, smoke, WP		2.60		16	16	42					42
219	Gren, hand, incd		2.94		155	36	105	98	288	21	61	454
220	Gren, hand, smoke, colored		1.36		100			84	114	16	21	135
221	Gren, hand, smoke, HC		2.56		42			42	107			107
222	Gun, mach, 7.62-mm	2,640	0.093	2	5,280	880	163	880	163	880	163	489
223	Lchr, gren, 40-mm	30	0.75	9	270	6	40	6	40	18	121	201
224	Mine, M14		0.49		11					11	5	5
225	Mine, M16		11.20		6					6	67	67
226	Mine, M21		22.70		17					17	385	385
227	Pistol, cal .45	21	0.056	37	777	21	43					43
228	Revolver, cal .38	18	0.038	4	72	18	2					2
229	Rifle, 5.56-mm, with bipod	740	0.042	121	89,540	140	711	360	1,829	240	1,219	3,759
230	Rifle, 90-mm	18	27.50	2	36			6	330	12	660	990
231	Rkt, 66-mm, M72		7.80		24	8	62	16	124			186
232	Total wt											7,324
233	STON											3.7
	MP co (TOE 19-67G)											
234	Gren, hand, frag		2.125		156	156	331					331
235	Gren, hand, incd		2.94		69			64	186	5	15	201
236	Gren, hand, riot, CN-DM		2.06		48					48	99	99
237	Gren, hand, riot, CS		1.875		160					160	300	300
238	Gren, hand, riot, CS1		1.00		350					350	350	350
239	Gren, hand, riot, DM1		1.00		200					200	200	200
240	Gren, hand, smoke, colored		1.36		64			64	87			87
241	Gren, hand, smoke, HC		2.56		8					8	20	20
242	Gun, mach, 7.62-mm	2,640	0.093	8	21,120			1,760	1,309	880	654	1,963
243	Lchr, gren, 40-mm	30	0.75	13	390	6	58	6	58	18	175	291
244	Pistol, cal .45	21	0.056	43	903	21	50					50
245	Revolver, cal .38	18	0.038	2	36	18	1					1
246	Rifle, 5.56-mm, with bipod	740	0.042	111	82,140	140	652	360	1,678	240	1,118	3,448
247	Rkt, 66-mm, M72		7.80		15	5	39	10	78			117
248	Total wt											7,458
249	STON											3.7

Table 5-35. Infantry Division (Mechanized) Base (Less Artillery Units) (TOE 37G)—Basic Load of Ammunition

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	HHC, (TOE 37-4G)											
2	Carr, comd and recon, armd, M114			3								
3	Flare, sur, trip		1.94		36			12	70			70
4	Gren, hand, frag		2.125		24			8	51			51
5	Gun, mach, cal .50	945	0.395		2,835			945	1,119			1,119
6	Gun, mach, 7.62-mm	2,970	0.093		8,910			2,970	828			828
7	Lchr, gren, 40-mm	48	0.75		144			48	108			108
8	Carr, CP, M577			2								
9	Flare, sur, trip		1.94		24			12	46			46
10	Gren, hand, frag		2.125		40			20	85			85
11	Flare, sur, trip		1.94		60			60	116			116
12	Gren, hand, frag		2.125		168	168	357					357
13	Gren, hand, incd		2.94		148			138	405	10	29	434
14	Gren, hand, smoke, colored		1.36		56			24	32	32	43	75
15	Gren, hand, smoke, HC		2.56		20			12	30	8	20	50
16	Gun, mach, cal .50	525	0.395	2	1,050			525	414			414
17	Mine, M18		6.80		10					10	68	68
18	Pistol, cal .45	21	0.056	32	672	21	37					37
19	Revolver, cal .38	18	0.038	14	252	18	9					9
20	Rifle, 7.62-mm	100	0.083	147	14,700	100	1,220					1,220
21	Total wt											5,087
22	STON											2.5
	MP co (TOE 19-27G)											
23	Disperser, ptbl, riot con	64 (lb)	2.08	4	256 (lb)					64 (lb)	532	532
24	Gren, hand, frag		2.125		194			194	412			412
25	Gren, hand, incd		2.94		110			108	317	2	5	322
26	Gren, hand, riot, CN-DM		2.06		48			48	99			99
27	Gren, hand, riot, CS		1.875		160			160	300			300
28	Gren, hand, riot, CS1		1.00		350			350	350			350
29	Gren, hand, riot, DM1		1.00		200			200	200			200
30	Gren, hand, smoke, colored		1.36		96			96	130			130
31	Gren, hand, smoke, HC		2.56		8			8	20			20
32	Gun, mach, 7.62-mm	3,080	0.093	9	27,720			2,200	1,841	880	736	2,577
33	Lchr, gren, 40-mm	30	0.75	16	480	18	216	6	72	6	72	360
34	Pistol, cal .45	21	0.056	49	1,029	21	57					57

35	Revolver, cal .38	18	0.038	2	36	18	1					1
36	Rifle, 7.62-mm	340	0.083	109	37,060	100	904	120	1,085	120	1,085	3,074
37	Rifle, 7.62-mm, with bipod	740	0.083	34	25,160	260	733	240	677	240	677	2,087
38	Rifle, 90-mm	18	27.50	9	162	6	1,485	6	1,485	6	1,485	4,455
39	Starter, fire, NP3		0.07		14			14	1			1
40	Total wt											14,977
41	STON											7.5
	Sig bn (TOE 11-35G)											
42	Flare, sur, trip		1.94		17					17	32	32
43	Gren, hand, frag		2.125		641	641	1,362					1,362
44	Gren, hand, incd		2.94		689			376	1,105	313	920	2,025
45	Gren, hand, smoke, colored		1.36		96					96	130	130
46	Gren, hand, smoke, HC [1]		2.56		24					24	61	61
47	Gren, hand, smoke, HC [2]		2.56		48					48	122	122
48	Gun, mach, cal [1]	525	0.395	9	4,725			315	1,119	210	746	1,865
49	Gun, mach, cal [2] .50	630	0.395	1	630			315	125	315	124	249
50	Gun, mach, 7.62-mm	3,080	0.093	3	9,240			2,200	613	880	245	858
51	Lchr, gren, 40-mm [1]	10	0.75	7	70			10	52			52
52	Lchr, gren, 40-mm [2]	30	0.75	9	270	18	121	6	40	6	40	201
53	Mine, M14		0.49		12					12	5	5
54	Mine, M16		11.20		6					6	67	67
55	Mine, M21		22.70		17					17	385	385
56	Pistol, cal .45	21	0.056	32	672	21	37					37
57	Rifle, 7.62-mm [1]	160	0.083	443	70,880	100	3,676	60	2,206			5,882
58	Rifle, 7.62-mm [2]	340	0.083	166	56,440	100	1,377	120	1,653	120	1,653	4,683
59	Rkt, 66-mm, M7 [2]		7.80		156	52	405	104	811			1,216
60	Total wt											19,232
61	STON											9.6
	Engr bn (TOE 5-145G)											
62	Carr, pers, M113			44								
63	Flare, sur, trip		1.94		528			12	1,024			1,024
64	Gren, hand, frag		2.125		880			20	1,870			1,870
65	Gun, mach, cal .50	2,100	0.395		92,400			2,100	36,498			36,498
66	Chg, dml, 2½-lb block, M038	40	3.33	2,080						2,080	6,926	6,926
67	CEV			8								
68	Gren, hand, frag		2.125		64			8	136			136
69	Gun, dml, 165-mm	30	92.40		240			302	22,176			22,176
70	Gun, mach, cal .50	735	0.395		5,880			735	2,322			2,322
71	Gun, mach, 7.62-mm	3,410	0.093		27,280			3,410	2,537			2,537
72	Dml set, explo initiating, elec and semielec			52					12,217			12,217
73	Gren, hand, frag		2.125		449	449	954					954
74	Gren, hand, incd		2.94		615			582	1,711	33	97	1,808

See footnotes at end of table.

Table 5-35. Infantry Division (Mechanized) Base (Less Artillery Units) (TOE 37G)—Basic Load of Ammunition—Continued

1	Unit and type of munition	Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indiv		Carried on veh		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	Engr bn (TOE 5-145G)—Continued											
75	Gren, hand, smoke, colored		1.36		192			192	261			261
76	Gren, hand, smoke, HC		2.56		288			288	737			737
77	Gun, mach, 7.62-mm	3,080	0.093	15	46,200			2,200	3,069	880	1,227	4,296
78	Lchr, gren, 40-mm	30	0.75	89	2,670	18	1,201	6	400	6	400	2,001
79	Mine, M16		11.20		74			34	380	40	448	828
80	Mine, M18		6.80		142			132	897	10	68	965
81	Mine, M21		22.70		927			407	9,238	520	11,804	21,042
82	Pistol, cal .45	21	0.056	161	3,381	21	189					189
83	Recov veh, mdm, M88			2								
84	Flare, sur, trip		1.94		32			16	62			62
85	Gren, hand, frag		2.125		16			8	34			34
86	Gun, mach, cal .50	1,600	0.395		3,200			1,600	1,264			1,264
87	Gun, submachine, cal .45	180	0.056		360			180	20			20
88	Rkt, 66-mm, M72		7.80		20			10	156			156
89	Rifle, 7.62-mm	340	0.083	752	255,680	100	6,241	120	7,489	120	7,489	21,219
90	Rifle, 7.62-mm, with bipod	740	0.083	103	76,220	140	1,196	360	3,077	240	2,051	6,324
91	Rkt, 66-mm M72		7.80		390	130	1,014	260	2,028			3,042
92	Smokepot, fltg, SGF2		37.00		38					38	1,406	1,406
93	Smokepot, HC		54.00		72			72	3,888			3,888
94	Total wt											156,202
95	STON											78.1
	HHC, bde (TOE 37-42G)											
96	Carr, comd and recon, armd, M114			3								
97	Flare, sur, trip		1.94		36			12	70			70
98	Gren, hand, frag		2.125		24			8	51			51
99	Gun, mach, cal .50	945	0.395		2,835			945	1,119			1,119
100	Gun, mach, 7.62-mm	2,970	0.093		8,910			2,970	828			828
101	Lchr, gren, 40-mm	48	0.75		144			48	108			108
102	Carr, CP, M577			6								
103	Flare, sur, trip		1.94		72			12	139			139
104	Gren, hand, frag		2.125		120			20	255			255
105	Carr, pers, M113			4								
106	Flare, sur, trip		1.94		48			12	93			93
107	Gren, hand, frag		2.125		80			20	170			170

108	Gun, mach, cal .50	1,995	0.395		7,980			1,995	3,152			3,152
109	Flare, sur, trip		1.94		54			40	77	14	27	104
110	Gren, hand and rifle, smoke, WP		2.60		16	16	42					42
111	Gren, hand, frag		2.125		142	142	301					301
112	Gren, hand, incd		2.94		188			142	417	46	135	552
113	Gren, hand, smoke, colored		1.36		32			16	21	16	21	42
114	Gren, hand, smoke, HC		2.56		54			8	20	46	118	138
115	Gun, mach, cal .50	525	0.395	3	1,575			525	622			622
116	Gun, mach, 7.62-mm	3,080	0.093	5	15,400			2,200	1,023	880	409	1,432
117	Gun, submachine, cal .45	180	0.056	2	360			180	20			20
118	Lchr, gren, 40-mm	30	0.75	11	330	18	148	6	49	6	49	246
119	Mine, M14		0.49		13					13	6	6
120	Mine, M16		11.20		6					6	67	67
121	Mine, M18		6.80		28					28	190	190
122	Mine, M21		22.70		76					76	1,725	1,725
123	Pistol, cal .45	21	0.056	40	840	21	47					47
124	Recov veh, lt, M578			1								
125	Flare, sur, trip		1.94		16			16	31			31
126	Gren, hand, frag		2.125		8			8	17			17
127	Gun, mach, cal .50	525	0.395		525			525	207			207
128	Revolver, cal .38	18	0.038	4	72	18	2					2
129	Rifle, 7.62-mm	160	0.083	134	21,440	100	1,112	60	667			1,779
130	Rifle, 7.62-mm, with bipod	740	0.083	6	4,440	260	129	240	119	240	119	367
131	Rifle, 90-mm	18	27.50	2	36	6	330	6	330	6	330	990
132	Total wt											14,912
133	STON											7.5

Armd cav sqdn (TOE 17-105G)

134	Armt subsys, 40-mm, M5	321	1.06	7	2,247			107	794	214	1,587	2,381
135	Armt subsys, GM lchr, M22			4								
136	AGM22B	36	112.00		144			6	2,688	30	13,440	16,128
137	Bolt, exp 60	36	3.316		144			6	79	30	399	478
138	Armt subsys, 7.62-mm, M23	4,200	0.093	6	25,200			1,200	669	3,000	1,674	2,343
139	Armt subsys, 7.62-mm, XM27	4,500	0.093	9	40,500			1,500	1,255	3,000	2,511	3,766
140	Carr, comd and recon, armd, M114				50							
141	Flare, sur, trip		1.94		600			12	1,164			1,164
142	Gren, hand, frag		2.125		400			8	850			850
143	Gun, mach, cal .50	945	0.395		47,250			945	18,663			18,663
144	Gun, mach, 7.62-mm	2,970	0.093		48,500			2,970	13,810			13,810
145	Lchr, gren, 40-mm	48	0.75		2,400			48	1,800			1,800
146	Carr, CP, M577			6								
147	Flare, sur, trip		1.94		72			12	139			139
148	Gren, hand, frag		2.125		120			20	255			255
149	Carr, pers, M113			25								
150	Flare, sur, trip		1.94		300			12	582			582

Table 5–35. Infantry Division (Mechanized) Base (Less Artillery Units) (TOE 37G)—Basic Load of Ammunition—Continued

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type of munition	Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indlv		Carried on veh		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	Armd cav sqdn (TOE17–105G)—Continued											
151	Gren, hand, frag		2. 125	-------	500	-------		20	1, 062	-------		1, 062
152	Gun, mach, cal .50	1, 995	0. 395	-------	49, 875	-------		1, 995	19, 700	-------		19, 700
153	Dml set, explo, initiating, nonelec			9	-------			-------	1, 368	-------		1, 368
154	Flare, sur, trip		1. 94	-------	59	-------		59	114	-------		114
155	Gren, hand and rifle, smoke, WP		2. 605	64	64	168	-------					168
156	Gren, hand, frag		2. 125	-------	195	195	414					414
157	Gren, hand, incd		2. 94	-------	827	-------		790	2, 322	37	109	2, 431
158	Gren, hand, smoke, colored		1. 36	-------	296	-------		296	402	-------		402
159	Gren, hand, smoke, HC		2. 56	-------	292	-------		292	747	-------		747
160	GM sys, intcp, aerial, XM41E1		29. 30	-------	15	3	88	12	351	-------		439
161	Gun, mach, cal .50	630	0. 395	32	20, 160	-------		315	3, 981	315	3, 981	7, 962
162	Gun, mach, 7.62-mm	3, 080	0. 093	13	40, 040	-------		2, 200	2, 660	-------	1, 064	3, 724
163	Gun, submachine, cal .45	180	0. 056	6	1, 080	180	60					60
164	Lchr, gren, 40-mm	30	0. 75	58	1, 740	18	783	6	261	6	261	1, 305
165	Mine, M14		0. 49	-------	32	-------		32	15	-------		15
166	Mine, M16		11. 20	-------	16	-------		16	179	-------		179
167	Mine, M18		6. 80	-------	234	-------		-------		234	1, 591	1, 591
168	Mine, M21		22. 70	-------	362	-------		-------		362	8, 217	8, 217
169	Mort, 4.2-in., SP	163	40. 00	9	1, 467	-------		83	29, 880	80	28, 800	58, 680
170	Flare, sur, trip		1. 94	-------	90	-------		10	174	-------		174
171	Fuze, proximity		3. 84	-------	414	-------		23	794	23	794	1, 588
172	Fuze, pt-detonating		3. 25	-------	108	-------		12	351	-------		351
173	Gren, hand, frag		2. 125	-------	72	-------		8	153	-------		153
174	Gun, mach, cal .50	2, 205	0. 395	-------	19, 845	-------		2, 205	7, 838	-------		7, 838
175	Lchr, rkt, 76-mm		7. 80	-------	90	-------		10	702	-------		702
176	Pistol, cal .45	21	0. 056	274	5, 754	21	322					322
177	Recov veh, lt, M578			5	-------							
178	Flare, sur, trip		1. 94	-------	80	-------		16	155	-------		155
179	Gren, hand, frag		2. 125	-------	40	-------		8	85	-------		85
180	Gun, mach, cal .50	525	0. 395	-------	2, 625	-------		525	1, 036	-------		1, 036
181	Revolver, cal .38	18	0. 038	78	1, 404	18	53					53
182	Rifle, 7.62-mm	340	0. 083	527	179, 180	100	4, 461	120	5, 205	120	5, 205	14, 871
183	Rifle, 7.62-mm, with bipod	740	0. 083	26	19, 240	140	302	360	777	240	518	1, 597
184	Tk, 76-mm gun	70	42. 00	27	1, 890	-------		65	73, 710	5	5, 670	79, 380

185	Flare, sur, trip		1. 94		324		12	628				628
186	Gren, hand, frag		2. 125		216		8	459				459
187	Gun, mach, cal .30	5, 000	0. 089		135, 000		5, 000	12, 015				12, 015
188	Gun, mach, cal .50	2, 175	0. 395		58, 725		2, 175	23, 196				23, 196
189	Gun, submachine, cal .45	180	0. 056		4, 860		180	272				272
190	Total wt											315, 812
191	STON											157. 9
	HHC and band, DISCOM (TOE 29–2G)											
192	Gren, hand, frag		2. 125		104		104	221				221
193	Gren, hand, incd		2. 94		35		35	102				102
194	Gren, hand, smoke, colored		1. 36		32		32	43				43
195	Gren, hand, smoke, HC		2. 56		8		8	20				20
196	Gun, mach, 7.62-mm	3, 080	0. 093	2	6, 160		2, 200	409	880	163		572
197	Pistol, cal .45	21	0. 056	10	210	21	11					11
198	Rifle, 7.62-mm	340	0. 083	92	31, 280	100	763	120	916	120	916	2, 595
199	Total wt											3, 564
200	STON											1. 8
	Admin co (TOE 12–37G)											
201	Gren, hand, frag		2. 125		397		397	843				843
202	Gren, hand, incd		2. 94		72		72	211				211
203	Gren, hand, smoke, colored		1. 36		32		32	43				43
204	Gren, hand, smoke, HC		2. 56		8		8	20				20
205	Gun, mach, cal .50	525	0. 395	4	2, 100		525	829				829
206	Gun, mach, 7.62-mm	3, 080	0. 093	15	46, 200		2, 200	3, 069	880	1, 227		4, 296
207	Pistol, cal .45	21	0. 056	16	336	21	18					18
208	Rifle, 7.62-mm	340	0. 083	380	129, 200	100	3, 154	120	3, 784	120	3, 784	10, 722
209	Total wt											16, 982
210	STON											8. 5
	Med bn (TOE 8–35G)											
211	Gren, hand, frag		2. 125		411	411	873					873
212	Gren, hand, incd		2. 94		271		254	746	17	49		795
213	Gren, hand, smoke, colored		1. 36		128	128	174					174
214	Gren, hand, smoke, HC		2. 56		32		32	81				81
215	Pistol, cal .45	21	0. 056	23	483	21	27					27
216	Rifle, 7.62-mm	160	0. 083	388	62, 080	100	3, 220	60	1, 932			5, 152
217	Total wt											7, 102
218	STON											3. 6

Table 5–35. Infantry Division (Mechanized) Base (Less Artillery Units) (TOE 37G)—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	S&T bn (TOE 29–65G)											
219	Gren, hand, frag		2.125		558	558	1,185					1,185
220	Gren, hand, smoke, incd		2.94		406			376	1,105	30	88	1,193
221	Gren, hand, smoke, colored		1.36		96			96	130			130
222	Gren, hand, smoke, HC		2.56		24			24	61			61
223	Gun, mach, 7.62-mm	2,200	0.093	34	74,800			2,200	6,956			6,956
224	Pistol, cal .45	21	0.056	8	168	21	9					9
225	Pistol, pyrotechnic	48	0.63	2	96			48	60			60
226	Revolver, cal .38	18	0.038	3	54	18	2					2
227	Rifle, 7.62-mm	160	0.083	543	86,880	100	4,506	60	2,704			7,210
228	Rifle, 7.62-mm, with bipod	740	0.083	4	2,960	140	46	360	119	240	79	244
229	Total wt											17,050
230	STON											8.5
	Maint bn (TOE 29–25G)											
231	Gren, hand, frag		2.125		891	891	1,893					1,893
232	Gren, hand, incd		2.94		552			540	1,587	12	35	1,622
233	Gren, hand, smoke, colored		1.36		168			8	10	160	217	227
234	Gren, hand, smoke, HC		2.56		44			4	10	40	102	112
235	Gun, mach, 7.62-mm	2,200	0.093	17	37,400			2,200	3,478			3,478
236	Pistol cal .45	21	0.056	17	357	21	20					20
237	Recov veh, mdm, M88			4								
238	Flare, sur, trip		1.94		64			16	124			124
239	Gren, hand, frag		2.125		32			8	68			68
240	Gun, mach, cal .50	1,470	0.395		5,880			1,470	2,322			2,322
241	Gun, submachine, cal .45	180	0.056		720			180	40			40
242	Rkt, 66-mm, M72		7.80		40			10	312			312
243	Rifle, 7.62-mm	160	0.083	886	141,760	100	7,358	60	4,420			11,778
244	Rkt, 66-mm, M72		7.80		78	26	202	52	405			607
245	Starter, fire, NP3		0.07		40					40	2	2
246	Total wt											22,605
247	STON											11.3

[1] Sig bn (1) (cat II units).
[2] Fwd comm co (cat I unit).

Table 5-36. Armored Division (TOE 17G)—Weight of Basic Load of Ammunition

1	1 Unit	2 TOE	3 Wt of basic load for TOE wpns, mines, and dmls (tons)	4 Wt of basic load for on-veh armt (tons)	5 Total wt of unit basic load (tons)
2	HHC	17-4G	2.98	0.97	3.95
3	MP co	19-27G	7.49	0.00	7.49
4	Sig bn	11-35G	9.62	0.00	9.62
5	Engr bn	5-145G	45.77	32.40	78.17
6	3 bde HHC (each)	17-42G	5.60	2.84	8.44
7	Armd cav sqdn	17-105G	37.93	119.47	157.40
8	HHB, div arty	6-302G	4.60	0.00	4.60
9	3 FA bn, 155-mm, SP (each)	6-365G	19.61	342.23	361.84
10	FA bn, 155-mm/8-in. SP	6-355G	15.89	267.60	283.49
11	FA bn, HJ	6-175G	6.20	72.72	78.92
12	ADA bn C/V, SP	44-325G	8.21	80.84	89.05
13	HHC and band, DISCOM	29-2G	1.78	0.00	1.78
14	Admin co	12-37G	8.48	0.00	8.48
15	Med bn	8-35G	3.55	0.00	3.55
16	Maint bn	29-35G	10.62	1.16	11.78
17	S&T bn	29-65G	8.03	0.00	8.03
18	Tk bn	17-35G	53.44	156.32	209.76
19	Inf bn (mech)	7-45G	45.98	57.50	103.48

Table 5-37. Infantry Division (TOE 7G)—Weight of Basic Load of Ammunition

1	1 Unit	2 TOE	3 Wt of basic load for TOE wpns, mines, and dmls (tons)	4 Wt of basic load for on-veh armt (tons)	5 Total wt of unit basic load (tons)
2	HHC	7-4G	1.13	0.00	1.13
3	MP co	19-27G	7.49	0.00	7.49
4	Avn bn	1-75G	8.77	15.16	23.93
5	Sig bn	11-35G	9.62	0.00	9.62
6	Engr bn	5-155G	34.67	12.59	47.26
7	3 bde HHC (each)	7-42G	3.95	0.00	3.95
8	Armd cav sqdn	17-105G	37.93	119.47	157.40
9	HHB, div arty	6-302G	4.60	0.00	4.60
10	3 FA bn, 105-mm, (each)	6-155G	9.66	122.05	131.71
11	FA bn, 155-mm/8-in., towed	6-165G	13.24	238.38	251.62
12	FA bn, HJ	6-175G	6.20	72.72	78.92
13	ADA bn, C/V, SP	44-325G	8.21	80.84	89.05
14	HHC and band, DISCOM	29-2G	1.78	0.00	1.78
15	Admin co	12-37G	8.48	0.00	8.48
16	Med bn	8-35G	3.55	0.00	3.55
17	S&T bn	29-5G	12.25	0.00	12.25
18	Maint bn	29-15G	16.61	1.16	17.77
19	Tk bn	17-35G	53.44	156.32	209.76
20	Inf bn	7-15G	37.56	23.16	60.72

Table 5–38. Infantry Division (Mechanized) (TOE 37G)—Weight of Basic Load of Ammunition

1	1 Unit	2 TOE	3 Wt of basic load for TOE wpns, mines, and dmls (tons)	4 Wt of basic load for on-veh armt (tons)	5 Total wt of unit basic load (tons)
2	HHC	37–4G	1. 57	1. 03	2. 60
3	MP co	19–27G	7. 49	0. 00	7. 49
4	Sig bn	11–35G	9. 62	0. 00	9. 62
5	Engr bn	5–145G	45. 77	32. 40	78. 17
6	3 bde HHC (each)	37–42G	4. 81	2. 65	7. 46
7	Armd cav sqdn	17–105G	37. 93	119. 47	157. 40
8	HHB, div arty	6–302G	4. 60	0. 00	4. 60
9	3 FA bn, 155-mm, SP (each)	6–365G	19. 61	342. 23	361. 84
10	FA bn, 155-mm/8-in. SP	6–355G	15. 89	267. 60	283. 49
11	FA bn, HJ	6–175G	6. 20	72. 72	78. 92
12	ADA bn, C/V SP	44–325G	8. 21	80. 84	89. 05
13	HHC and band, DISCOM	29–2G	1. 78	0. 00	1. 78
14	Admin co	12–37G	8. 48	0. 00	8. 48
15	Med bn	8–35G	3. 55	0. 00	3. 55
16	Maint bn	29–25G	10. 10	1. 20	11. 30
17	S&T bn	29–65G	8. 03	0. 00	8. 03
18	Tk bn	17–35G	53. 44	156. 32	209. 76
19	Inf bn (each)	7–45G	45. 98	57. 50	103. 48

Table 5-39. Combat Units—Basic Load of Ammunition

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	Inf bn, inf div (TOE 7-15G)											
2	Burster, fld, incd		2.50		40					40	100	100
3	Dml set, explo, initiating, elec and semi-elec.			3					704			704
4	Dml set, explo, initiating, nonelec			1					152			152
5	Flare, sur, trip		1.94		85					85	164	164
6	Guidance and launching sta (Entac)	15	112.00	3	45			15	5,040			5,040
7	GM sys, intcp, aerial, XM41E1		29.30		12	3	88	9	263			351
8	Gren, hand and rifle, smoke, WP		2.60		144	144	374					374
9	Gren, hand, frag		2.125		849	849	1,804					1,804
10	Gren, hand, incd		2.94		342			342	1,005			1,005
11	Gren, hand, smoke, colored		1.36		176			176	239			239
12	Gren, hand, smoke, HC		2.56		192			192	491			491
13	Gun, mach, cal .50	630	0.395	13	8,190			420	2,156	210	1,078	3,234
14	Gun, mach, 7.62-mm	3,080	0.093	25	77,000	880	2,046	1,320	3,069	880	2,046	7,161
15	Lchr, gren, 40-mm	30	0.75	85	2,550	18	1,147	6	382	6	382	1,911
16	Mine, M14		0.49		57					57	27	27
17	Mine, M16		11.20		28					28	313	313
18	Mine, M21		22.70		85					85	1,929	1,929
19	Mort, 81-mm			9								
20	Fuze, proximity		3.84		216			12	414	12	414	828
21	Fuze, pt-detonating		3.25		108			12	351			351
22	Proj, 81-mm	120	17.32		1,080			80	12,470	40	6,235	18,705
23	Mort, 4.2-in., SP			4								
24	Fuze, proximity		3.84		180			23	353	22	337	690
25	Fuze, pt-detonating		3.25		44			11	143			143
26	Proj, 4.2-in	160	40.00		640			50	8,000	110	17,600	25,600
27	Pistol, cal .45	31	0.056	239	7,409	21	281			10	133	414
28	Rifle, cal .50, spotting	220	0.331	8	1,760			110	291	110	291	582
29	Rifle, 7.62-mm	340	0.083	554	188,360	100	4,598	120	5,517	120	5,517	15,632
30	Rifle, 7.62-mm, with bipod	740	0.083	56	41,440	160	743	380	1,766	200	929	3,438
31	Rifle, 90-mm	18	27.50	18	324	6	2,970	6	2,970	6	2,970	8,910
32	Rifle, 106-mm	40	60.50	8	320	6	2,904	10	4,840	24	11,616	19,360
33	Rkt, 66-mm, M72		7.80		102	34	265	68	530			795
34	Smokepot, HC		54.00		18			18	972			972
35	Total wt											121,419
36	STON											60.7

Table 5-39. Combat Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	Inf bn (mech), armd or inf (mech) div (TOE 7-45G)											
37	Burster, fld, incd		2.50		40					40	100	100
38	Carr, comd and recon, armd, M114			14								
39	Flare, sur, trip		1.94		168			12	325			325
40	Gren, hand, frag		2.125		112			8	238			238
41	Gun, mach, cal .50	1,365	0.395		19,110			1,050	5,806	315	1,741	7,547
42	Gun, mach, 7.62-mm	3,520	0.093		49,280			2,970	3,866	550	716	4,582
43	Lchr, gren, 40-mm	48	0.75		672			48	504			504
44	Carr, pers, M113			49								
45	Flare, sur, trip		1.94		588			12	1,140			1,140
46	Gren, hand, frag		2.125		980			20	2,082			2,082
47	Gun, mach, cal .50	2,100	0.395		102,900			2,100	40,645			40,645
48	Dml set, explo, initiating, elec and semi-elec			1					234			234
49	Flare, sur, trip		1.94		80			80	155			155
50	Guidance and launching sta (Entac)	15	112.00	3	45			15	5,040			5,040
51	GM sys, intcp, acrial, XM41E1		29.30		12	3	88	9	263			351
52	Gren, hand and rifle, smoke, WP		2.60		144	144	374					374
53	Gren, hand, frag		2.125		802	802	1,704					1,704
54	Gren, hand, incd		2.94		609			594	1,746	15	44	1,790
55	Gren, hand, smoke, colored		1.36		176			144	195	32	43	238
56	Gren, hand, smoke, HC		2.56		192			192	491			491
57	Gun, mach, cal .50	525	0.395	20	10,500			420	3,318	105	829	4,147
58	Gun, mach, 7.62-mm	3,080	0.093	49	150,920	880	4,010	1,320	6,015	880	4,010	14,035
59	Gun, submachine, cal .45	180	0.056	10	1,800			180	100			100
60	Lchr, gren, 40-mm	30	0.75	94	2,820	18	1,269	6	423	6	423	2,115
61	Mine, M14		0.49		62			62	30			30
62	Mine, M16		11.20		31					31	347	347
63	Mine, M18		6.80		176			140	952	36	244	1,196
64	Mine, M21		22.70		370			370	8,399			8,399
65	Mort, 81-mm			9								
66	Flare, sur, trip		1.94		90			10	174			174
67	Gren, hand, frag		2.125		72			8	153			153
68	Gun, mach, cal .50	2,100	0.395		18,900			525	1,866	1,575	5,599	7,465
69	Proj, 81-mm	155	17.32		1,395			114	17,770	41	6,391	24,161
70	Mort, 4.2-in., SP			4								

71	Flare, sur, trip		1.94		40		10	77				77
72	Gren, hand, frag		2.125		32		8	68				68
73	Gun, mach, cal .50	2,205	0.395		8,820		2,205	3,483				3,483
74	Proj, 4.2-in	163	40.00		652		93	14,866	70	11,214		26,080
75	Rkt, 66-mm, M72		7.80		40		10	312				312
76	Pistol, cal .45	21	0.056	256	5,376	21	301					301
77	Recov veh, lt, M578			5								
78	Flare, sur, trip		1.94		80		16	155				155
79	Gren, hand, frag		2.125		40		8	85				85
80	Gun, mach, cal .50	525	0.395		2,625		525	1,036				1,036
81	Rifle, cal .50, spotting	220	0.331	6	1,320		110	218	110	218		436
82	Rifle, 7.62-mm	340	0.083	614	208,760	100	5,096	120	6,115	120	6,115	17,326
83	Rifle, 7.62-mm, with bipod	740	0.083	54	39,960	140	627	360	1,613	240	1,075	3,315
84	Rifle, 90-mm	18	27.50	18	324	6	2,970	6	2,970	6	2,970	8,910
85	Rifle, 106-mm	40	60.50	6	240		16	5,808	24	8,712		14,520
86	Smokepot, HC		54.00		18		18	927				972
87	Starter, fire, NP3		0.07		46		46	3				3
88	Total wt											206,941
89	STON											103.5

Tk bn (TOE 17-35G)

90	Carr, comd and recon, armd, M114			9								
91	Flare, sur, trip		1.94		108		12	210				210
92	Gren, hand, frag		2.125		72		8	153				153
93	Gun, mach, cal .50	945	0.395		8,505		945	3,360				3,360
94	Gun, mach, 7.62-mm	2,970	0.093		26,730		2,970	2,486				2,486
95	Lchr, gren, 40-mm	48	0.75		432		48	324				324
96	Carr, CP, M577			7								
97	Flare, sur, trip		1.94		112		16	217				217
98	Gren, hand, freg		2.125		56		8	119				119
99	Carr, pers			13								
100	Flare, sur, trip		1.94		156		12	303				303
101	Gren, hand, frag		2.125		130		10	276				276
102	Gun, mach, cal .50	1,995	0.395		25,935		1,995	10,244				10,244
103	Dml set, explo, initiating, nonelec			1				152				152
104	Flare, sur, trip		1.94		308		308	597				597
105	Gren, hand, frag		2.125		308	308	654					654
106	Gren, hand, incd		2.94		327		327	961				961
107	Gren, hand, smoke, colored		1.36		128		128	174				174
108	Gren, hand, smoke, HC		2.56		192		192	491				491
109	GM sys, intcp, aerial, XM41E1		29.30		12	3	88	9	263			351
110	Gun, mach, cal .50	525	0.395	22	11,550		315	2,737	210	1,825		4,562
111	Gun, mach, 7.62-mm	3,080	0.093	4	12,320		2,200	818	880	327		1,145
112	Gun, submachine, cal .45	180	0.056	118	21,240		180	1,189				1,189

Table 5–39. Combat Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	Tk bn (TOE 17–35G)—Continued											
113	Lchr, gren, 40-mm	30	0. 75	19	570	18	256	6	85	6	85	426
114	Mine, M14		0. 49		40					40	19	19
115	Mine, M16		11. 20		20					20	224	224
116	Mine, M18		6. 80		74					74	503	503
117	Mine, M21		22. 70		60					60	1, 362	1, 362
118	Mort, 4.2-in., SP			4								
119	Flare, sur, trip		1. 94		40			10	77			77
120	Fuze, proximity		3. 84		184			23	353	23	353	706
121	Fuze, pt-detonating		3. 25		48			12	156			156
122	Gren, hand, frag		2. 125		32			8	68			68
123	Gun, mach, cal .50	2, 205	0. 395		8, 820			2, 205	3, 483			3, 483
124	Prof, 4.2-in	163	40. 00		652			83	13, 280	80	12, 800	26, 080
125	Rkt, 66-mm, M72		7. 80		40			10	312			312
126	Pistol, cal .45	21	0. 056	323	6, 783	21	379					379
127	Recov veh, mdm			5								
128	Flare, sur, trip		1. 94		80			16	155			155
129	Gren, hand, frag		2. 125		40			8	85			85
130	Gun, mach, cal .50	1, 470	0. 395		7, 350			1, 470	2, 903			2, 903
131	Gun, submachine, cal .45	180	0. 056		900			180	50			50
132	Rkt, 66-mm, M72		7. 80		50			10	390			390
133	Rifle, 7.62-mm	340	0. 083	276	93, 840	100	2, 290	120	2, 749	120	2, 749	7, 788
134	Tk, cbt, 105-mm gun, M60A1			54								
135	Ctg, 105-mm	78	68. 49		4, 212			63	233, 668	15	54, 811	288, 479
136	Flare, sur, trip		1. 94		648			12	1, 257			1, 257
137	Gren, hand, frag		2. 125		432			8	918			918
138	Gun, mach, cal .50	1, 260	0. 395		68, 040			840	17, 917	420	8, 958	26, 875
139	Gun, mach, 7.62-mm	5, 940	0. 093		320, 760			5, 940	29, 830			29, 830
140	Gun, submachine, cal .45	360	0. 056		19, 440			360	1, 088			1, 088
141	Total wt											421, 581
142	STON											210. 8

Table 5–40. Combat Support Units—Basic Load of Ammunition

1	Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	FA units											
	FA bn, 105-mm, towed, sep 1t inf bde (6–115T):											
2	Flare, sur, trip		1.94		48			24	47	24	47	94
3	Gren, hand, frag		2.125		474	474	1,007					1,007
4	Gren, hand, incd		2.94		382			382	1,123			1,123
5	Gren, hand, smoke, colored		1.36		128			64	87	64	87	174
6	Gren, hand, smoke, HC		2.56		32			32	82			82
7	Gun, mach, 7.62-mm	1,760	0.093	20	35,200			880	1,637	880	1,637	3,274
8	How, 105-mm, towed	200	65.00	18	3,600			40	46,800	160	187,200	234,000
9	Lchr, gren, 40-mm	26	0.75	18	468	8	108	18	243			351
10	Mine, M15		49.00		78			39	1,911	39	1,911	3,822
11	Mine, M18A1		8.83		24			24	212			212
12	Pistol, cal .45	21	0.056	40	840	21	47					47
13	Rifle, 7.62-mm	160	0.083	434	69,440	100	3,602	60	2,161			5,763
14	Rkt, 66-mm, M72		7.80		92			18	140	74	577	717
15	Smokepot, HC		54.00		24			24	1,296			1,296
16	Total wt											251,962
17	STON											126.0
	FA bn, 105-mm, towed (div) (6–155G):											
18	Flare, sur, trip		1.94		53			24	47	29	56	103
19	Gren, hand, frag		2.125		531	531	1,128					1,128
20	Gren, hand, incd		2.94		482			482	1,417			1,417
21	Gren, hand, smoke, colored		1.36		128			64	87	64	87	174
22	Gren, hand, smoke, HC		2.56		32			32	82			82
23	GM sys, intcp, aerial XM41E1		29.30		9	3	88	6	176			264
24	Gun, mach, 7.62-mm	1,760	0.093	32	56,320			880	2,619	880	2,619	5,238
25	How, 105-mm, towed	200	65.00	18	3,600			60	70,200	140	163,800	234,000
26	Lchr, gren, 40-mm	26	0.75	21	546	8	126	18	284			410
27	Mine, M15		49.00		78			78	3,822			3,822
28	Mine, M18A1		8.83		24			24	212			212
29	Pistol, cal .45	21	0.056	45	945	21	53					53
30	Rifle, 7.62-mm	160	0.083	486	77,760	100	4,034	60	2,420			6,454
31	Rkt, 66-mm, M72		7.80		92			18	140	74	577	717
32	Smokepot, HC		54.00		24			24	1,296			1,296
33	Total wt											255,370
34	STON											127.7

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	FA units—Continued											
	FA bn, 155-mm, towed 18-in., SP (div) (6-165G):											
35	Flare, sur, trip		1.94		67			30	58	37	72	130
36	Gren, hand, frag		2.125		675	675	1,434					1,434
37	Gren, hand, incd		2.94		532			532	1,564			1,564
38	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
39	Gren, hand, smoke, HC		2.56		40			40	102			102
40	GM sys, intcp, aerial, XM41E1		29.30		12	4	117	8	234			351
41	Gun, mach, cal .50	525	0.395	1	525			525	207			207
42	Gun, mach, 7.62-mm	1,760	0.093	49	86,240			880	4,010	880	4,010	8,020
43	How, 155-mm, towed	150	133.20	18	2,700			28	67,133	122	292,507	359,640
44	How, 8-in. SP	100	266.00	4	400			2	2,128	98	104,272	106,400
45	Lchr, gren, 40-mm	26	0.75	33	858	8	198	18	446			644
46	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
47	Mine, M18A1		8.83		30			30	265			265
48	Pistol, cal .45	21	0.056	59	1,239	21	69					69
49	Rifle, 7.62-mm	160	0.083	618	98,880	100	5,129	60	3,078			8,207
50	Rkt, 66-mm, M72		7.80		115			24	187	91	710	897
51	Smokepot, HC		54.00		30			30	1,620			1,620
52	Total wt											494,668
53	STON											247.3
	FA bn, HJ (div) (6-175G):											
54	Flare, sur, trip		1.94		28			18	35	10	19	54
55	Gren, hand, frag		2.125		283	283	601					601
56	Gren, hand, incd		2.94		342			342	1,005			1,005
57	Gren, hand, smoke, colored		1.36		96			48	65	48	65	130
58	Gren, hand, smoke, HC		2.56		24			12	31	12	31	62
59	Gun, mach, 7.62-mm	1,760	0.093	23	40,480			880	1,882	880	1,882	3,764
60	Lchr, gren, 40-mm	26	0.75	17	442	8	102	18	230			332
61	Mine, M15		49.00		60			30	1,470	30	1,470	2,940
62	Mine, M18A1		8.83		18			18	159			159
63	Pistol, cal .45	21	0.056	31	651	21	36					36
64	Rifle, 7.62-mm	160	0.083	252	40,320	100	2,092	60	1,255			3,347
65	Rkt, 66-mm, M72		7.80		68			18	140	50	390	530
66	Smokepot, HC		54.00		18			18	972			972
67	Total wt											13,932
68	STON											7.0

	FA bn, 105-mm, towed, sep inf bde (TOE 6-185G):											
69	Flare, sur, trip		1.94		54			54	105			105
70	Gren, hand, frag		2.125		540	540	1,148					1,148
71	Gren, hand, incd		2.94		622			622	1,829			1,829
72	Gren, hand, smoke, colored		1.36		128			64	87	64	87	174
73	Gren, hand, smoke, HC		2.56		32			32	82			82
74	GM sys, intcp, aerial, XM41E1		29.30		12	3	88	9	264			352
75	Gun, mach, 7.62-mm	1,760	0.093	33	58,080			880	2,701	880	2,701	5,402
76	How, 105-mm, towed	200	65.00	18	3,600			60	70,200	140	163,800	234,000
77	Lchr, gren, 40-mm	26	0.75	21	546	8	126	18	284			410
78	Mine, M15		49.00		80			40	1,960	40	1,960	3,920
79	Mine, M18A1		8.83		24			24	212			212
80	Pistol, cal .45	21	0.056	47	987	21	55					55
81	Rifle, 7.62-mm	160	0.083	493	78,880	100	4,092	60	2,455			6,547
82	Rkt, 66-mm, M72		7.80		88			24	187	64	499	686
83	Smokepot, HC		54.00		24			24	1,296			1,296
84	Total wt											256,218
85	STON											128.1
	HHB, div arty (6-302G):											
86	Flare, sur, trip		1.94		35			35	68			68
87	Gren, hand, frag		2.125		234	234	497					497
88	Gren, hand, incd		2.94		310			310	911			911
89	Gren, hand, smoke, colored		1.36		76			76	103			103
90	Gren, hand, smoke, HC		2.56		16	8		8	20			20
91	Gun, mach, 7.62-mm	1,760	0.093	10	17,600	880	818	880	818			1,636
92	Lchr, gren, 40-mm	26	0.75	4	104	8	24	18	54			78
93	Mine, M15		49.00		20			20	980			980
94	Mine, M18A1		8.83		6			6	53			53
95	Pistol, cal .45	21	0.056	31	651	21	36					36
96	Revolver, cal .38	50	0.038	16	800	50	30					30
97	Rifle, 7.62-mm	160	0.083	185	29,600	100	1,536	60	921			2,457
98	Rkt, 66-mm, M72		7.80		22	10	78	12	94			172
99	Smokepot, HC		54.00		6			6	324			324
100	Total wt											7,365
101	STON											3.7
	FA bn, 105-mm, SP (div) (6-345G):											
102	Flare, sur, trip		1.94		48			48	94			94
103	Gren, hand, frag		2.125		482	482	1,024					1,024
104	Gren, hand, incd		2.94		538			538	1,582			1,582
105	Gren, hand, smoke, colored		1.36		128			80	109	48	65	174
106	Gren, hand, smoke, HC		2.56		32			32	82			82
107	GM sys, intcp, aerial, XM41E1		29.30		9	3	88	6	176			264
108	Gun, mach, cal .50 (OEM M108 how)	1,050	0.395	18	18,900			1,050	7,466			7,466
109	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	2	1,050			525	415			415

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	FA Units—Continued											
110	Gun, mach, 7.62-mm	1,760	0.093	17	29,920			880	1,391	880	1,391	2,782
111	How, 105-mm, SP	250	65.00	18	4,500			87	101,790	163	190,710	292,500
112	Lchr, gren, 40-mm	26	0.75	25	650	8	150	18	338			488
113	Mine, M15		49.00		80			40	1,960	40	1,960	3,920
114	Mine, M18A1		8.83		24			24	212			212
115	Pistol, cal .45	21	0.056	53	1,113	21	62					62
116	Rifle, 7.62-mm	160	0.083	433	69,280	100	3,594	60	2,156			5,750
117	Rkt, 66-mm, M72		7.80		88			24	187	64	499	686
118	Smokepot, HC		54.00		24			24	1,296			1,296
119	Total wt											318,797
120	STON											159.4
	FA bn, 155-mm 18-in., SP (div) (6-355G):											
121	Flare, sur, trip		1.94		67			67	130			130
122	Gren, hand, frag		2.125		670	670	1,424					1,424
123	Gren, hand, incd		2.94		708			708	2,082			2,082
124	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
125	Gren, hand, smoke, HC		2.56		40			20	51	20	51	102
126	GM sys, intcp, aerial, XM41E1		29.30		12	4	117	8	234			351
127	Gun, mach, cal .50 (OEM M88 recov veh).	1,575	0.395	1	1,575			1,575	622			622
128	Gun, mach, cal .50 (OEM M578 recov veh).	525	0.395	1	525			525	207			207
129	Gun, mach, cal .50 (OEM M109 how)	525	0.395	18	9,450			525	3,733			3,733
130	Gun, mach, 7.62-mm	1,760	0.093	30	52,800			880	2,455	880	2,455	4,910
131	How, 155-mm, SP	150	133.20	18	2,700			28	67,133	122	292,507	359,640
132	How, 8-in, SP	100	266.00	4	400			2	2,128	98	104,272	106,400
133	Lchr, gren, 40-mm	26	0.75	36	936	8	216	18	486			702
134	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
135	Mine, M18A1		8.83		30			30	265			265
136	Pistol, cal .45	21	0.056	65	1,365	21	76					76
137	Rifle, 7.62-mm	160	0.083	635	101,600	100	5,271	60	3,162			8,433
138	Rkt, 66-mm, M72		7.80		110			40	312	70	546	858
139	Smokepot, HC		54.00		30			30	1,620			1,620
140	Total wt											496,673
141	STON											248.3

	FA bn, 155-mm, SP (div) (6–365G):											
142	Flare, sur, trip		1.94	--------	63	----------		63	122	----------		122
143	Gren, hand, frag		2.125	--------	632	632	1,343	----------				1,343
144	Gren, hand, incd		2.94	--------	659	----------		659	1,937	----------		1,937
145	Gren, hand, smoke, colored		1.36	--------	160	----------		80	109	80	109	218
146	Gren, hand, smoke, HC		2.56	--------	40	----------		20	51	20	51	102
147	GM sys, intcp, aerial, XM41E1		29.30	--------	9	3	88	6	176	----------		264
148	Gun, mach, cal .50 (OEM M109 how)	525	0.359	18	9,450	----------		525	3,733	----------		3,733
149	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	1	525	----------		525	207	----------		207
150	Gun, mach, 7.62-mm	1,760	0.093	39	68,640	----------		880	3,192	880	3,192	6,384
151	How, 155-mm, SP	275	133.20	18	4,950	----------		28	67,133	247	592,207	659,340
152	Lchr, gren, 40-mm	26	0.75	54	1,404	8	324	18	729	----------		1,053
153	Mine, M15		49.00	--------	100	----------		50	2,450	50	2,450	4,900
154	Mine, M18A1		8.83	--------	30	----------		30	265	----------		265
155	Pistol, cal .45	21	0.056	77	1,617	21	91	----------				91
156	Rifle, 7.62-mm	160	0.083	557	89,120	100	4,623	60	2,774	----------		7,397
157	Rkt, 66-mm, M72		7.80	--------	110	----------		40	312	70	546	858
158	Smokepot, HC		54.00	--------	30	----------		30	1,620	----------		1,620
159	Total wt											689,834
160	STON											344.9
	FA bn, 155-mm, SP, sep armd bde or sep inf bde (mech) (6–375G):											
161	Flare, sur, trip		1.94	--------	66	----------		66	128	----------		128
162	Gren, hand, frag		2.125	--------	658	658	1,398	----------				1,398
163	Gren, hand, incd		2.94	--------	694	----------		694	2,040	----------		2,040
164	Gren, hand, smoke, colored		1.36	--------	160	----------		80	109	80	109	218
165	Gren, hand, smoke, HC		2.56	--------	40	----------		40	102	----------		102
166	GM sys, intcp, aerial, XM41E1		29.30	--------	12	4	117	8	234	----------		351
167	Gun, mach, cal .50 (OEM M109 how)	525	0.395	18	9,450	----------		525	3,733	----------		3,733
168	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	1	525	----------		525	207	----------		207
169	Gun, mach, 7.62-mm	1,760	0.093	40	70,400	----------		880	3,274	880	3,274	6,548
170	How, 155-mm, SP	275	133.20	18	4,950	----------		28	67,133	247	592,207	659,340
171	Lchr, gren, 40-mm	26	0.75	54	1,404	8	324	18	729	----------		1,053
172	Mine, M15		49.00	--------	100	----------		50	2,450	50	2,450	4,900
173	Mine, M18A1		8.83	--------	30	----------		30	265	----------		265
174	Pistol, cal .45	21	0.056	77	1,617	21	91	----------				91
175	Rifle, 7.62-mm	160	0.083	583	93,280	100	4,839	60	2,903	----------		7,742
176	Rkt, 66-mm, M72		7.80	--------	110	----------		40	312	70	546	858
177	Smokepot, HC		54.00	--------	30	----------		30	1,620	----------		1,620
178	Total wt											690,594
179	STON											345.3

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	FA units—Continued											
	FA bn, 105-mm, SP, sep armd bde or sep inf bde (mech) (6-385G):											
180	Flare, trip		1.94		50			25	49	25	49	98
181	Gren, hand, frag		2.125		499	499	1,060					1,060
182	Gren, hand, incd		2.94		580			580	1,705			1,705
183	Gren, hand, smoke, colored		1.36		128			64	87	64	87	174
184	Gren, hand, smoke, HC		2.56		32			32	82			82
185	GM sys, intcp, aerial, XM41E1		29.30		12	4	117	8	234			351
186	Gun, mach, cal .50 (OEM M108 how)	1,050	0.395	18	18,900			1,050	7,466			7,466
187	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	2	1,050			525	415			415
188	Gun, mach, 7.62-mm	1,760	0.093	18	31,680			880	1,473	880	1,473	2,946
189	How, 105-mm, SP	250	65.00	18	4,500			87	101,790	163	190,710	292,500
190	Lchr, gren, 40-mm	26	0.75	21	456	8	126	18	284			410
191	Mine, M15		49.00		80			40	1,960	40	1,960	3,920
192	Mine, M18A1		8.83		24			24	212			212
193	Pistol, cal .45	21	0.056	51	1,071	21	60					60
194	Rifle, 7.62-mm	160	0.083	452	72,320	100	3,752	60	2,251			6,003
195	Rkt, 66-mm, M72		7.80		88			24	187	64	499	686
196	Smokepot, HC		54.00		24			24	1,296			1,296
197	Total wt											319,384
198	STON											159.7
	HHB, FA gp (6-401G):											
199	Flare, sur, trip		1.94		14			14	27			27
200	Gren, hand, frag		2.125		135	185	287					287
201	Gren, hand, incd		2.94		172			172	506			506
202	Gren, hand, smoke, colored		1.36		56			56	76			76
203	Gren, hand, smoke, HC		2.56		20			20	51			51
204	Gun, mach, 7.62-mm	1,760	0.093	5	8,800	880	409	880	409			818
205	Lchr, gren, 40-mm	26	0.75	7	182	8	42	18	95			137
206	Mine, M15		49.00		20			20	980			980
207	Mine, M18A1		8.83		6			6	53			53
208	Pistol, cal .45	21	0.056	26	546	21	31					31
209	Revolver, cal .38	50	0.038	7	350	50	13					13
210	Rifle, 7.62-mm	160	0.083	101	16,160	100	838	60	503			1,341

211	Rkt, 66-mm, M72		7.80		22			22	172			172
212	Smokepot, HC		54.00		6			6	324			324
213	Total wt											4,816
214	STON											2.4
	FA bn, 105-mm, towed (nondiv) (6-405G):											
215	Flare, sur, trip		1.94		52			26	50	26	50	100
216	Gren, hand, frag		2.125		517	517	1,099					1,099
217	Green, hand, incd		2.94		432			432	1,270			1,270
218	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
219	Gren, hand, smoke, HC		2.56		40			40	102			102
220	GM sys, intcp, aerial, XM41E1		29.30		9	3	88	6	176			264
221	Gun, mach, 7.62-mm	1,760	0.093	35	61,600			880	2,864	880	2,864	5,728
222	How, 105-mm, towed	200	65.00	18	3,600			60	70,200	140	163,800	234,000
223	Lchr, gren, 40-mm	26	0.75	31	806	8	186	18	419			605
224	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
225	Mine, M18A1		8.83		30			30	265			265
226	Pistol, cal .45	21	0.05	50	1,050	21	59					59
227	Rifle, 7.62-mm	160	0.08	466	74,560	100	3,868	60	2,321			6,189
228	Rkt, 66-mm, M72		7.80		110			40	312	70	546	858
229	Smokepot, HC		54.00		30			15	810	15	810	1,620
230	Total wt											257,277
231	STON											128.6
	FA bn, 155-mm, towed (nondiv) (6-425G):											
232	Flare, sur, trip		1.94		56			28	54	28	54	108
233	Gren, hand, frag		2.125		563	563	1,196					1,196
234	Gren, hand, incd		2.94		231			231	679			679
235	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
236	Gren, hand, smoke, HC		2.56		40			40	102			102
237	GM sys, intcp, aerial, XM41E1		29.30		9	3	88	6	176			264
238	Gun, mach, 7.62-mm	1,760	0.093	39	68,640	880	3,192	880	3,192			6,384
239	How, 155-mm, towed	150	133.20	18	2,700			28	67,133	122	292,507	359,640
240	Lchr, gren, 40-mm	26	0.75	38	988	8	288	18	513			741
241	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
242	Mine, M18A1		8.83		30			30	265			265
243	Pistol, cal .45	21	0.056	51	1,071	21	60					60
244	Rifle, 7.62-mm	160	0.083	511	81,760	100	4,241	60	2,545			6,786
245	Rkt, 66-mm, M72		7.80		110			40	312	70	546	858
246	Smokepot, HC		54.00		30			15	810	15	810	1,620
247	Total wt											383,821
248	STON											191.9

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	FA units—Continued											
	FA bn, 175-mm, SP (6-435G):											
249	Flare, sur, trip		1.94		55			30	58	25	49	107
250	Gren, hand, frag		2.125		550	550	1,169					1,169
251	Gren, hand, incd		2.94		558			558	1,641			1,641
252	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
253	Gren, hand, smoke, HC		2.56		40			40	102			102
254	GM sys, intcp, aerial, XM41E1		29.30		9	3	88	6	176			264
255	Gun, FA, 175-mm, SP	114	275.00	12	1,368			2	6,600	112	369,600	376,200
256	Gun, mach, cal .50 (OEM M578 recov veh).	525	0.395	1	525			525	207			207
257	Gun, mach, 7.62-mm	1,760	0.093	30	52,800	880	2,455	880	2,455			4,910
258	Lchr, gren, 40-mm	26	0.75	16	416	8	96	18	216			312
259	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
260	Mine, M18A1		8.83		30			30	265			265
261	Pistol, cal .45	21	0.056	41	861	21	48					48
262	Rifle, 7.62-mm	160	0.083	510	81,600	100	4,233	60	2,540			6,773
263	Rkt, 66-mm, M72		7.80		110			40	321	70	546	858
264	Smokepot		54.00		30			15	810	15	810	1,620
265	Total wt											399,594
266	STON											199.8
	FA bn, 8-in, SP (nondiv) (6-445G):											
267	Flare, sur, trip		1.94		62			32	62	30	58	120
268	Gren, hand, frag		2.125		618	618	1,313					1,313
269	Gren, hand, incd		2.94		554			554	1,629			1,629
270	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
271	Gren, hand, smoke, HC		2.56		40			40	102			102
272	GM sys, intcp, aerial, XM41E1		29,30		9	3	88	6	176			264
273	Gun, mach, cal .50 (OEM M88 recov veh).	1,575	0.395	1	1,575			1,575	622			622
274	Gun, mach, 7.62-mm	1,760	0.093	45	79,200			880	3,683	880	3,683	7,366
275	How, 8-in., SP	100	266.00	12	1,200			2	6,384	98	312,816	319,200
276	Lchr, gren, 40-mm	26	0.75	29	754	8	174	18	392			566
277	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
278	Mine, M18A1		8.83		30			30	265			265
279	Pistol, cal .45	21	0.056	53	1,113	21	62					62
280	Rifle, 7.62-mm	160	0.083	566	90,560	100	4,698	60	2,819			7,517

281	Rkt, 66-mm M72		7.80		110			50	390	60	468	858
282	Smokepot, HC		54.00		30			15	810	15	810	1,620
283	Total wt											346,622
284	STON											173.3
	FA bn, 155-mm, SP (nondiv) (6-455G):											
285	Flare, sur, trip		1.94		51			30	58	21	41	99
286	Gren, hand, frag		2.125		506	506	1,075					1,075
287	Gren, hand, incd		2.94		543			543	1,596			1,596
288	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
289	Gren, hand, smoke, HC		2.56		40			40	102			102
290	GM sys, intcp, aerial, XM41E1		29.30		9	3	88	6	176			264
291	Gun, mach, cal .50 (OEM M109 how)	525	0.395	18	9,450			525	3,733			3,733
292	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	1	525			525	207			207
293	Gun, mach, 7.62-mm	1,760	0.093	26	45,760			880	2,128	880	2,128	4,256
294	How, 155-mm, SP	150	133.20	18	2,700			28	67,133	122	292,507	359,640
295	Lchr, gren, 40-mm	26	0.275	31	806	8	186	18	419			605
296	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
297	Mine, M18A1		8.83		30			30	265			265
298	Pistol, cal .45	21	0.056	46	966	21	54					54
299	Rifle, 7.62-mm	160	0.083	461	73,760	100	3,826	60	2,296			6,122
300	Rkt, 66-mm, M72		7.80		110			40	312	70	546	858
301	Smokepot, HC		54.00		30			15	810	15	810	1,620
302	Total wt											385,614
303	STON											192.8
	FA bn, 105-mm SP (nondiv) (6-465G):											
304	Flare, sur, trip		1.94		49			30	58	19	37	95
305	Gren, hand, frag		2.125		489	489	1,039					1,039
306	Gren, hand, incd		2.94		493			493	1,449			1,449
307	Gren, hand, smoke, colored		1.36		160			80	109	80	109	218
308	Gren, hand, smoke, HC		2.56		40			40	102			102
309	GM sys, intcp, aerial, XM41E1		29.30		9	3	88	6	176			264
310	Gun, mach, cal .50 (OEM M108 how)	1,050	0.395	18	18,900			1,050	7,466			7,466
311	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	1	525			525	207			207
312	Gun, mach, 7.62-mm	1,760	0.093	23	40,480			880	1,882	880	1,882	3,764
313	How, 105-mm, SP	260	65.00	18	4,680			87	101,790	173	202,410	304,200
314	Lchr, gren, 40-mm	26	0.75	28	728	8	168	18	378			546
315	Mine, M15		49.00		100			50	2,450	50	2,450	4,900
316	Mine, M18A1		8.83		30			30	265			265
317	Pistol, cal .45	21	0.056	47	987	21	55					55
318	Rifle, 7.62-mm	160	0.083	441	70,560	100	3,660	60	2,196			5,856
319	Rkt, 66-mm, M72		7.80		110			40	312	70	546	858

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type of munition	Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indiv		Carried on veh		Bulk loaded		Total wt (lb)
					Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
FA units—Continued											
Smokepot, HC		54.00		30			15	810	15	810	1,620
Total wt											332,904
STON											166.5
HHB, corps arty (6-501G):											
Flare, sur, trip		1.94		21			21	41			41
Gren, hand, frag		2.125		211	211	448					448
Gren, hand, incd		2.94		322			322	947			947
Gren, hand, smoke, colored		1.36		40			40	54			54
Gren, hand, smoke, HC		2.56		12			12	31			31
Gun, mach, 7.62-mm	1,760	0.093	7	12,320	880	573	880	573			1,146
Lchr, gren, 40-mm	26	0.75	2	52	8	12	18	27			39
Mine, M15		49.00		20			20	980			980
Mine, M18A1		8.83		6			6	53			53
Pistol, cal .45	21	0.056	30	630	21	35					35
Revolver, cal .38	50	0.038	3	150	50	6					6
Rifle, 7.62-mm	160	0.083	177	28,320	100	1,469	60	881			2,350
Rkt, 66-mm, M72		7.80		22			22	172			172
Smokepot, HC		54.00		6			6	324			324
Total wt											6,626
STON											3.3
HHB, abn corps arty (6-502G):											
Flare, sur, trip		1.94		20			20	39			39
Gren, hand, frag		2.125		202	202	429					429
Gren, hand, incd		2.94		282			282	829			829
Gren, hand, smoke, colored		1.36		40			40	54			54
Gren, hand, smoke, HC		2.56		12			12	31			31
Gun, mach, 7.62-mm	1,760	0.093	2	3,520	880	164	880	164			328
Lchr, gren, 40-mm	26	0.75	7	182	8	42	18	95			137
Mine, M19		36.00		20			20	720			720
Pistol, cal .45	21	0.056	23	483	21	27					27
Revolver, cal .38	50	0.038	3	150	50	6					6
Rifle, 7.62-mm	160	0.083	175	28,000	100	1,453	60	872			2,325
Rkt, 66-mm, M72		7.80		22			22	172			172
Smokepot, HC		54.00		6			6	324			324
Total wt											5,421
STON											2.7

	FA bn, HJ (nondiv) (6-525G):										
354	Flare, sur, trip		1.94		41		41	80			80
355	Gren, hand, frag		2.125		408	408	867				867
356	Gren, hand, incd		2.94		570		570	1,676			1,676
357	Gren, hand, smoke, colored		1.36		124		124	169			169
358	Gren, hand, smoke, HC		2.56		32		32	82			82
359	Gun, mach, 7.62-mm	1,760	0.093	30	52,800	880	2,455	880	2,455		4,910
360	Lchr, gren, 40-mm	26	0.75	37	962	8	222	18	500		722
361	Mine, M15		49.00		80		80	3,920			3,920
362	Mine, M18A1		8.83		24		24	212			212
363	Pistol, cal .45	21	0.056	57	1,197	21	67				67
364	Rifle, 7.62-mm	160	0.083	350	56,000	100	2,905	60	1,743		4,648
365	Rkt, 66-mm, M72		7.80		88		88	686			686
366	Smokepot, HC		54.00		24		24	1,296			1,296
367	Total wt										19,335
368	STON										9.7
	FA bn, SGT (6-555G):										
369	Flare, sur, trip		1.94		38		38	74			74
370	Gren, hand, frag		2.125		377	377	801				801
371	Gren, hand, incd		2.94		471		471	1,385			1,385
372	Gren, hand, smoke, colored		1.36		96		96	131			131
373	Gren, hand, smoke, HC		2.56		24		24	61			61
374	Gun, mach, 7.62-mm	1,760	0.093	28	49,280	880	2,292	880	2,292		4,584
375	Lchr, gren, 40-mm	26	0.75	36	936	8	216	18	486		702
376	Mine, M15		49.00		60		60	2,940			2,940
377	Mine, M18A1		8.83		18		18	159			159
378	Pistol, cal .45	21	0.056	57	1,197	21	67				67
379	Rifle, 7.62-mm	160	0.083	319	51,040	100	2,648	60	1,589		4,237
380	Rkt, 66-mm, M72		7.80		66		66	515			515
381	Smokepot, HC		54.00		18		18	972			972
382	Total wt										16,628
383	STON										8.3
	FA btry, slt (6-558G):										
384	Flare, sur, trip		1.94		15		15	29			29
385	Gren, hand, frag		2.125		154	154	327				327
386	Gren, hand, incd		2.94		217		217	638			638
387	Gren, hand, smoke, colored		1.36		32		32	44			44
388	Gren, hand, smoke, HC		2.56		8		8	20			20
389	Gun, mach, 7.62-mm	1,760	0.093	20	35,200	880	1,637	880	1,637		3,274
390	Lchr, gren, 40-mm	26	0.75	8	208	8	48	18	108		156
391	Mine, M15		49.00		20		20	980			980
392	Mine, M18A1		8.83		8		8	71			71
393	Pistol, cal .45	21	0.056	9	189	21	11				11
394	Rifle, 7.62-mm	160	0.083	145	23,200	100	1,204	60	722		1,926
395	Rkt, 66-mm, M72		7.80		22	12	94	10	78		172

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	FA units—Continued											
396	Smokepot, HC		54.00		6			6	324			324
397	Total wt											7,972
398	STON											4.0
	FATAB (6-575E):											
399	Flare, sur, trip		1.94		76			76	147			147
400	Gren, hand, frag		2.125		762	762	1,619					1,619
401	Gren, hand, incd		2.94		950			950	2,793			2,793
402	Gren, hand, smoke, colored		1.36		128			128	174			174
403	Gren, hand, smoke, HC		2.56		32			32	82			82
404	Gun, mach, 7.62-mm	1,760	0.093	55	96,800	880	4,501	880	4,501			9,002
405	Lchr, gren, 40-mm	26	0.75	37	962	8	222	18	500			722
406	Mine, M15		49.00		80			80	3,920			3,920
407	Mine, M18A1		8.83		24			24	212			212
408	Pistol, cal .45	21	0.056	52	1,092	21	61					61
409	Rifle, 7.62-mm	160	0.083	710	113,600	100	5,893	60	3,536			9,429
410	Rkt, 66-mm, M72		7.80		88	40	312	48	374			686
411	Smokepot, HC		54.00		30			30	1,620			1,620
412	Total wt											30,467
413	STON											15.2
	FA bn, PERSH (6-615D):											
414	Flare, sur, trip		1.94		110			110	213			213
415	Gren, hand, frag		2.125		1,101	1,101	2,340					2,340
416	Gren, hand, incd		2.94		1,099			1,099	3,231			3,231
417	Gren, hand, smoke, colored		1.36		208			208	283			283
418	Gren, hand, smoke, HC		2.56		56			56	143			143
419	Gun, mach, cal .50 (OEM M578 recov veh)	525	0.395	1	525			525	207			207
420	Gun, mach, 7.62-mm	1,760	0.093	33	58,080	880	2,701	880	2,701			5,402
421	Lchr, gren, 40-mm	26	0.75	60	1,560	8	360	18	810			1,170
422	Mine, M15		49.00		120			120	5,880			5,880
423	Mine, M18A1		8.83		36			36	318			318
424	Pistol, cal .45	21	0.056	111	2,331	21	131					131
425	Pistol, pyrotechnic	48	0.63	1	48	48	30					30
426	Revolver, cal .38	50	0.038	8	400	50	15					15
427	Rifle, 7.62-mm	160	0.083	983	157,280	100	8,159	60	4,895			13,054
428	Rkt, 66-mm, M72		7.80		132	50	390	82	640			1,030

429	Smokepot, HC		54.00		36			36	1,944			1,944
430	Total wt											35,391
431	STON											17.7
	ADA units											
	HHB, ADA bdc (TOE 44-2G):											
432	Gun, mach, 7.62-mm	530	0.093	4	2,120			530	197			197
433	Pistol, cal .45	21	0.056	14	294	21	16					16
434	Rifle, 7.62-mm	120	0.083	64	7,680	60	319	60	319			638
435	Rkt, 66-mm, M72		7.80		24			24	187			187
436	Total wt											1,038
437	STON											0.52
	HHB, ADA gp (TOE 44-12G):											
438	Gun, mach, 7.62-mm	530	0.093	4	2,120			530	197			197
439	Pistol, cal .45	21	0.056	13	273	21	15					15
440	Rifle, 7.62-mm	120	0.083	65	7,800	60	324	60	324			648
441	Rkt, 66-mm, M72		7.80		24			24	187			187
442	Total wt											1,047
443	STON											0.52
	ADA AW bn, SP (TOE 44-85G):											
444	Dml set, explo, initiating, elec and semielec			4							936	936
445	Flare, sur, trip		1.94		70					70	135	135
446	Gren				1,117	311	660	596	1,752	210	349	2,761
447	Gun, antiaircraft arty, SP. 40-mm, M42			64								
448	Ctg, 40-mm	720	6.87		46,080			480	211,046	240	105,523	316,596
449	Gren, hand, frag		2.125		512			512	1,088			1,088
450	Gun, mach, cal .30	1,750	0.089		112,000			1,750	9,968			9,968
451	Rkt, 66-mm, M72		7.80		256			256	1,997			1,997
452	Gun, mach, cal .50	530	0.395	13	6,890			530	2,722			2,722
453	Mines				150					150	1,937	1,937
454	Pistol, cal .45	21	0.056	21	441	21	25					25
455	Recov veh, lt, M578			1								
456	Flare, sur, trip		1.94		16			16	31			31
457	Gren, hand, frag		2.125		8			8	17			17
458	Gun, mach, cal .50	525	0.395		525			525	207			207
459	Rifle, 7.62-mm	160	0.083	698	111,680	100	5,839	60	3,430			9,269
460	Rkt, 76-mm, M72		7.80		120	40	312	80	624			936
461	Total wt											348,598
462	STON											174.3
	ADA bn, HAWK (TOE 44-235G):											
463	Gun, mach, 7.62-mm	530	0.093	29	15,370			530	1,429			1,429
464	Lchr, zero-lgth, GM			24								
465	Pistol, cal .45	21	0.056	90	1,890	21	106					106

Table 5–40. Combat Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	ADA Units—Continued											
466	Rifle, 7.62-mm	120	0. 083	801	96, 120	60	3, 989	60	3, 989			7, 978
467	Total wt											9, 513
468	STON											4. 8
	ADA bn, HERC (TOE 44–535G):											
469	Gun, mach, 7.62-mm	530	0. 093	34	18, 020			530	1, 676			1, 676
470	Lchr, monorail. GM (HERC)			36								
471	Pistol, cal .45	21	0. 056	37	777	21	44					44
472	Rifle, 7.62-mm	120	0. 083	884	106, 080	60	4, 402	60	4, 402			8, 804
473	Total wt											10, 524
474	STON											5. 3
	Avn units											
	Avn co (airmbl) or airmbl co (lt) (div) (TOE 1–77G):											
475	Armt subsys, 7.62-mm, M23	4, 200	0. 093	25	105, 000			1, 200	2, 790	3, 000	6, 975	9, 765
476	Dispenser, riot con, mtd	240(lb)	2. 08	6	1, 440(lb)					240(lb)	2, 995	2, 995
477	Flare, sur, trip		1. 94		269			250	485	19	36	521
478	Gren				512	189	401	242	534	81	169	1, 104
479	Gun, mach., 7.62-mm	2, 200	0. 093	2	4, 400			2, 200	409			409
480	Mines				38					38	504	504
481	Revolver, cal .38	18	0. 083	103	1, 854	18	70					70
482	Rifle, 7.62-mm	160	0. 083	86	13, 760	100	713	60	428			1, 141
483	Total wt											16, 509
484	STON											8. 3
	Corps avn co (TOE 1–127D):											
485	Flare, sur, trip		1. 94		290			290	562			562
486	Gren				503	163	346	284	538	56	111	995
487	Gun, mach, cal .50	525	0. 395	2	1, 050			525	414			414
488	Gun, mach, 7.62-mm	2, 200	0. 093	4	8, 800			2, 200	818			818
489	Pistol, cal .45	21	0. 056	38	798	21	44					44
490	Rifle, 7.62-mm	160	0. 083	125	20, 000	100	1, 037	60	622			1, 659
491	Rkt, 66-mm, M72		7. 80		12	4	31	8	62			93
492	Total wt											4, 585
493	STON											2. 3
	Avn aerial survl co (TOE 1–128T):											
494	Flare, sur, trip		1. 94		206			180	349	26	50	399
495	Gren				680	297	631	292	731	91	198	1, 560

496	Gun, mach, 7.62-mm	3,080	0.093	12	36,960			2,200	2,455	880	982	3,437
497	Lchr, gren, 40-mm	30	0.75	4	120	18	54	6	18	6	18	90
498	Mines				65					65	858	858
499	Pistol, cal .45	21	0.056	4	84	21	4					4
500	Revolver, cal .38	18	0.038	49	882	18	33					33
501	Rifle, 7.62-mm	340	0.083	244	82,960	100	2,025	120	2,430	120	2,430	6,885
502	Total wt											13,266
503	STON											6.6
	Cml units											
	HHD, cml smoke genr bn (TOE 3-266G):											
504	Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409			409
505	Lchr, gren, 40-mm	30	0.75	1	30	18	14	6	3	6	3	20
506	Pistol, cal .45	21	0.056	3	63	21	3					3
507	Rifle, 7.62-mm	160	0.083	26	4,160	60	129	100	215			344
508	Total wt											776
509	STON											0.39
	Cml smoke genr co (TOE 3-267G):											
510	Genr, smoke, fog oil	3 (gal)	461.00	48	144 (gal)			3 (gal)	66,384			66,384
511	Genr, smoke, gas	2 (gal)	42.00	48	96 (gal)			2 (gal)	4,032			4,032
512	Gun, mach, cal .50	530	0.395	3	1,590			530	628			628
513	Gun, mach, 7.62-mm	2,200	0.093	10	22,000			2,200	2,046			2,046
514	Lchr, gren, 40-mm	30	0.75	5	150	18	74	6	19	6	19	112
515	Pistol, cal .45	21	0.056	6	126	21	70					70
516	Rifle, 7.62-mm	160	0.083	141	22,560	60	702	100	1,170			1,872
517	Total wt											75,144
518	STON											37.6
	CBR cen (tm JA) (TOE 3-500E):											
519	Gren				9	6	12	3	8			20
520	Rifle, 7.62-mm	340	0.083	5	1,700	100	41	120	49	120	49	139
521	Total wt											159
522	STON											08
	Engr units											
	Engr cbt bn, army or corps (TOE 5-35G):											
523	Bulk explo	40	33.33		1,920					1,920	6,393	6,393
524	Dml set, explo, initiating, elec and semielec			48							11,277	11,277
525	Gren				1,614	794	1,683			820	2,135	3,818
526	Gun, mach, 7.62-mm	3,080	0.093	17	52,360			2,200	3,069	880	1,799	4,868
527	Lchr, gren, 40-mm	30	0.75	79	2,370	18	1,053	6	351	6	351	1,755
528	Pistol, cal .45	21	0.056	118	2,478	21	138					138

Table 5–40. Combat Support Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	Engr units—Continued											
529	Rifle, 7.62-mm	340	0. 083	628	213, 520	100	4, 855	240	12, 866			17, 721
530	Rifle, 7.62-mm, with bipod	760	0. 083	89	67, 640	160	1, 181	420	3, 102	180	1, 329	5, 612
531	Rkt, 66-mm, M72		7. 80		318	106	826	212	1, 653			2, 479
532	Smokepot, fltg, SGF2		37. 00		24					24	888	888
533	Smokepot, HC		54. 00		40					40	2, 160	2, 160
534	Total wt											57, 109
535	STON											28. 6
	Engr pnl brg co (TOE 5–77E):											
536	Gren				261	127	269	134	340			609
537	Gun, mach, cal .50	630	0. 395	3	1, 890			630	746			746
538	Gun, mach, 7.62-mm	2, 200	0. 093	2	4, 400			1, 100	204	1, 100	204	408
539	Pistol, cal .45	21	0. 056	1	21	21	1					1
540	Rifle, 7.62-mm	160	0. 083	126	20, 106	100	1, 045	60	627			1, 672
541	Rkt, 66-mm, M72		7. 80		9	3	23	6	46			69
542	Total wt											3, 505
543	STON											1. 8
	Engr fltbrg co (TOE 5–78G):											
544	Dml set, explo, initiating, elec and semiclec			5							1, 132	1, 132
545	Gren				537	225	478	268	787	44	75	1, 340
546	Gun, mach, cal .50	525	0. 395	15	7, 875			315	1, 741	210	1, 163	2, 904
547	Pistol, cal .45	21	0. 056	1	21	21	1					1
548	Rifle, 7.62-mm	160	0. 083	233	37, 280	100	1, 859	60	1, 230			3, 089
549	Rkt, 66-mm, M72		7. 80		12	4	31	8	62			93
550	Smokepot, fltg, SGF2		37. 00		8					8	296	296
551	Smokepot, HC		54. 00		12					12	648	648
552	Total wt											9, 503
553	STON											4. 8
	Engr dptrk co (TOE 5–124G):											
554	Gren				267	112	238	114	335	41	66	639
555	Pistol, cal .45	21	0. 056	1	21	21	1					1
556	Rifle, 7.62-mm	160	0. 083	111	17, 760	100	928	60	546			1, 474
557	Rifle, 7.62-mm, with bipod	760	0. 083	2	1, 520	160	26	420	69	180	29	124
558	Total wt											2, 238
559	STON											1. 1

	Engr topo co, corps (TOE 5–327G):											
560	Gren				237	129	274	66	194	42	69	537
561	Pistol, cal .45	21	0.056	14	294	21	16					16
562	Rifle, 7.62-mm	160	0.083	116	18,560	100	896	60	643			1,539
563	Rifle, 7.62-mm, with bipod	760	0.083	13	9,880	160	106	420	278	180	434	818
564	Rkt, 66-mm, M72		7.80		18	6	46	12	93			139
565	Total wt											3,049
566	STON											1.5
	MI											
	MI bn, air recon spt, fld army (TOE 30–5G):											
567	Flare, sur, trip		1.94		80			80	155			155
568	Gren				526	279	592	186	490	61	125	1,207
569	Pistol, cal .45	21	0.056	21	441	21	24					24
570	Rifle, 7.62-mm	160	0.083	260	41,600	100	2,141	60	1,310			3,451
571	Total wt											4,837
572	STON											2.4
	MID, sep bde or armd cav regt (TOE 30–14G):											
573	Gren				54	32	68	20	58	2	5	131
574	Pistol, cal .45	21	0.056	3	63	21	3					3
575	Rifle, 7.62-mm	160	0.083	29	4,640	100	240	60	144			384
576	Total wt											518
577	STON											0.26
	MID, div (TOE 30–17):											
578	Gren, hand, incd		2.94		42			40	117	2	5	122
579	Pistol, cal .45	21	0.056	16	336	21	18					18
580	Rifle, 7.62-mm	160	0.083	45	7,200	100	373	60	224			597
581	Total wt											737
582	STON											0.37
	MID corps (TOE 30–18G):											
583	Gren				120	72	153	46	135	2	5	293
584	Pistol, cal .45	21	0.056	10	210	21	11					11
585	Rifle, 7.62-mm	160	0.083	62	9,920	100	514	60	308			822
586	Total wt											1,126
587	STON											0.56
	MI bn, fld army (TOE 30–25E):*											
588	Crypto equip dest, M M1A2, TH4		55.00		26			26	1,430			1,430
589	File dest		160.00		27			27	4,320			4,320
590	Gren				1,272	599	1,272	336	774	337	776	2,822
591	Piston, cal .45	21	0.056	225	4,725	21	264					264
592	Rifle, 7.62-mm	160	0.083	374	59,840	100	3,104	60	1,862			4,966

See footnote at end of table.

Table 5-40. Combat Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
						Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	MI—Continued											
593	Total wt											13, 802
594	STON											6. 9
	MI bn (tm AD) (TOE 30-600D):											
595	Gren				60	39	82	21	61			143
596	Pistol, cal .45	21	0. 056	14	294	21	16					16
597	Rifle, 7.62-mm	160	0. 083	25	4, 000	100	207	60	124			331
598	Total wt											490
599	STON											0. 25
	Army security agency (ASA) units											
	HHC, ASA gp, fld army (TOE 32-52D):											
600	Gun, mach, cal .50	420	0. 395	2	840			420	332			332
601	Pistol, cal .45	21	0. 056	9	189	21	10					10
602	Rifle, 7.62-mm	100	0. 083	248	24, 800	100	2, 058					2, 058
603	Total wt											2, 400
604	STON											1. 0
	HHC, ASA bn (corps) (TOE 32-56F):											
605	Crypto equip dest, M1A2, TH4		55. 00		99			99	5, 445			5, 445
606	File dest		160. 00		13			13	2, 080			2, 080
607	Gren				321	187	397	86	238	48	87	722
608	Gun, mach, 7.62-mm	2, 200	0. 093	2	4, 400			2, 200	408			408
609	Lchr, gren, 40-mm	10	0. 75	9	90	10	67					67
610	Pistol, cal .45	21	0. 056	4	84	21	4					4
611	Rifle, 7.62-mm	160	0. 083	177	28, 320	100	1, 480	60	870			2, 350
612	Total wt											11, 076
613	STON											5. 5
	ASA div spt co (TOE 32-57F):											
614	Gun, mach, 7.62-mm	1, 760	0. 093	3	5, 280			3	491			491
615	Pistol, cal. 45	21	0. 056	1	21	21	1					1
616	Rifle, 7.62-mm	100	0. 083	232	23, 200	100	1, 926					1, 926
617	Total wt											2, 418
618	STON											1. 2
	ASA op co (TOE 32-67E):											
619	Gun, mach, cal .50	420	0. 395	7	2, 940			420	1, 161			1, 161
620	Lchr, rkt, 3,5-in	3	17. 70	3	9			3	159			159
621	Pistol, cal. 45	21	0. 056	1	21	21	1					1

622	Rifle, 7.62-mm	100	0.083	346	34,600	100	2,872					2,872
623	Total wt											4,193
624	STON											2.1
	ASA proc co (TOE 32-77D):											
625	Gun, mach, cal .50	420	0.395	2	840		420	332				332
626	Lchr, rkt, 3.5-in	3	17.70	2	6		3	106				106
627	Pistol, cal .45	21	0.506	1	21	21	1					1
628	Rifle, 7.62-mm	100	0.083	235	23,500	100	1,951					1,951
629	Total wt											2,390
630	STON											1.2
	ASA scty co (TOE 32-78D):											
631	Gun, mach, cal .50	420	0.395	2	840		420	332				332
632	Lchr, rkt, 3.5-in	3	17.70	2	6		3	106				106
633	Pistol, cal .45	21	0.056	1	21	21	1					1
634	Rifle, 7.62-mm	100	0.083	132	13,200	100	1,096					1,096
635	Total wt											1,535
636	STON											0.77
	Sig units											
	Corps sig bn (TOE 11-15D):											
637	Gren				1,426	690	1,468	420	1,234	316	768	3,470
638	Gun, mach, cal .50	525	0.395	8	4,200		525	1,659				1,659
639	Pistol, cal .45	21	0.056	20	420	21	23					23
640	Rifle, 7.62-mm	160	0.083	670	107,200	100	5,561	60	3,336			8,897
641	Rkt, 66-mm, M72		7.80		42	14	109	28	218			327
642	Total wt											14,376
643	STON											7.2
	Sig cbt area bn (TOE 11-85E):											
644	Crypto equip dest, M1A2, TH4		55.00		36					36	1,980	1,980
645	Gren				1,674	815	1,731	498	1,464	361	793	3,988
646	Gun, mach, 7.62-mm	3,080	0.093	14	43,120		2,200	2,864	880	1,145		4,009
647	Pistol, cal .45	21	0.056	8	168	21	9					9
648	Rifle, 7.62-mm	340	0.083	806	274,040	100	6,689	120	8,027	120	8,027	22,743
649	Rkt, 66-mm, M72		7.80		78	26	202	52	405			607
650	Total wt											33,336
651	STON											16.7
	Army sig bn (TOE 11-95D):											
652	Gun, mach, cal .50	525	0.395	4	2,100		315	498	210	332		830
653	Lchr, rkt, 3.5-in	6	17.70	4	24		3	212	3	212		424
654	Pistol, cal .45	21	0.056	51	1,071	21	47					47
655	Rifle, 7.62-mm	300	0.083	1,062	318,600	100	8,815	100	8,815	100	8,815	26,445
656	Total wt											27,746
657	STON											13.9

Table 5–40. Combat Support Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv		7 Carried on veh		8 Bulk loaded		9 Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	Sig units—Continued											
	Sig op co, mdm HQ (TOE 11–127E):											
658	Gren				506	207	439	80	235	219	590	1, 264
659	Gun, mach, 7.62-mm	2, 200	0. 093	1	2, 200			2, 200	204			204
660	Lchr, gren, 40-mm	10	0. 75	9	90	10	67					67
661	Pistol, cal .45	21	0. 056	28	588	21	32					32
662	Rifle, 7.62-mm	160	0. 083	179	28, 640	100	1, 485	60	891			2, 376
663	Rkt, 66-mm, M72		7. 80		6	2	15	4	31			46
664	Total wt											3, 989
665	STON											2. 0
	Sig small HQ op co (TOE 11–147E):											
666	Gren				284	122	259	90	211	72	167	637
667	Gun, mach, 7.62-mm	2, 200	0. 093	1	2, 200			2, 200	204			204
668	Lchr, gren, 40-mm	10	0. 75	6	60			10	45			45
669	Pistol, cal .45	21	0. 056	11	231	21	12					12
670	Rifle, 7.62-mm	160	0. 083	111	17, 760	100	921	60	552			1, 473
671	Rkt, 66-mm, M72		7. 80		6	2	15	4	31			46
672	Total wt											2, 417
673	STON											1. 2
	Sig svc org tms (NB, NC, RF, TE, TF, TG) (TOE 11–500D):											
674	Gun, mach, 7.62-mm	3, 000	0. 093	1	3, 000			1, 500	140	1, 500	140	280
675	Pistol, cal .45	21	0. 056	45	945	21	53					53
676	Rifle 7.62-mm	300	0. 083	103	30, 900	100	855	100	855	100	855	2, 565
677	Total wt											2, 898
678	STON											1. 4

*This unit is a carrier for MI co, TI (TOE 30-34G).

Table 5–41. Combat Service Support Units—Basic Load of Ammunition

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
			Packed			Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	Ammo units											
	HHC, ammo DS/GS gp (TOE 9–22G):											
2	Dml set, explo, initiating, elec and semielec			1							234	234
3	Gren				190	86	182	42	123	62	128	438
4	Gun, mach, 7.62-mm	2, 200	0. 093	2	4, 400			2, 200	409			409
5	Pistol, cal .45	21	0. 056	12	252	21	13					13
6	Rifle, 7.62-mm	160	0. 083	79	12, 640	100	655	60	393			1, 048
7	Rkt, 66-mm, M72		7. 80		6	2	15	4	31			46
8	Total wt											2, 183
9	STON											1. 1
	Ord sp ammo DS co (TOE 9–47G):											
10	Dml set, explo, initiating, elec and semielec			4							939	939
11	Gren				394	194	412	100	294	100	240	946
12	Gun, mach, 7.62-mm	2, 200	0. 093	11	24, 200			2, 200	2, 250			2, 250
13	Pistol, cal .45	21	0. 056	7	147	21	8					8
14	Rifle, 7.62-mm	160	0. 083	189	30, 240	100	1, 568	60	941			2, 509
15	Rkt, 66-mm M72		7. 80		12			12	93			93
16	Total wt											6, 745
17	STON											3. 4
	Maint units											
	LE GS maint co, army (TOE 29–134G):											
18	Gren				406	272	578	86	252	48	87	917
19	Lchr, gren, 40-mm	10	0. 75	7	70	10	52					52
20	Pistol, cal .45	21	0. 056	1	21	21	1					1
21	Rifle, 7.62-mm	160	0. 083	275	44, 000	100	2, 283	60	1, 369			3, 652
22	Rifle, 7.62-mm, with bipod	760	0. 083	3	2, 280	160	40	420	104	180	45	189
23	Total wt											4, 811
24	STON											2. 46
	HHD, maint (DS or GS bn), army (TOE 29–136G):											
25	Gren, hand, incd		2. 94		41			30	88	11	32	120
26	Lchr, gren, 40-mm	10	0. 75	2	20			5	7	5	7	14
27	Pistol, cal .45	21	0. 056	3	63	21	3					3
28	Rifle, 7.62-mm	160	0. 083	59	9, 440	100	494	60	290			784
29	Rifle, 7.62-mm, with bipod	760	0. 083	2	1, 520	160	27	420	69	180	30	126
30	Rkt, 66-mm, M72		7. 80		6	2	15	4	31			46
31	Total wt											1, 093
32	STON											0. 55

Table 5–41. Combat Service Support Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	Maint units—Continued											
	Coll, clas, and salv co (TOE)29-139F):											
33	Flare, sur, trip		1. 94		32			32	62			62
34	Gren				348	218	463	86	252	44	75	790
35	Gren, hand, frag		2. 125		16	16	34					34
36	Gun, mach, cal .50	1, 470	0. 395		2, 940			1, 470	1, 161			1, 161
37	Gun, submachine, cal .45	180	0. 056		360			180	20			20
38	Pistol, cal .45	21	0. 056	1	21	21	1					1
39	Recov veh, mdm, M88			2								
40	Rifle, 7.62-mm	160	0. 083	221	35, 360	100	1, 834	60	1, 100			2, 934
41	Rifle, 7.62-mm, with bipod	760	0. 083	4	3, 040	160	53	420	139	180	60	252
42	Rkt, 66-mm, M72		7. 80		20	10	156	10	156			312
43	Total wt											5, 566
44	STON											2. 8
	Trans acft DS co (TOE 55–457G):											
45	Flare, sur, trip		1. 94		20			20	38			38
46	Gren				423	260	552	114	321	49	90	963
47	Gun, mach, 7.62-mm	2, 200	0. 093	4	8, 800			2, 200	818			818
48	Lchr, gren, 40-mm	10	0. 75	12	120	10	90					90
49	Pistol, cal .45	21	0. 056	14	294	21	16					16
50	Revolver, cal .38	18	0. 038	11	198	18	8					8
51	Rifle, 7.62-mm	160	0. 083	240	38, 400	100	2, 008	60	1, 179			3, 187
52	Total wt											5, 120
53	STON											2. 6
	Trans acft maint GS co (TOE 55–458G):											
54	Flare, sur, trip		1. 94		20			20	38			38
55	Gren				419	286	607	90	250	43	72	929
56	Gun, mach, 7.62-mm	2, 200	0. 093	4	8, 800			2, 200	818			818
57	Lchr, gren, 40-mm	10	0. 75	8	80	10	60					60
58	Pistol, cal .45	21	0. 056	12	252	21	13					13
59	Revolver, cal .38	18	0. 038	9	162	18	6					6
60	Rifle, 7.62-mm	160	0. 083	269	43, 040	100	2, 232	60	1, 339			3, 571
61	Rkt, 66-mm, M72		7. 80		12	4	31	8	62			93
62	Total wt											5, 528
63	STON											2. 8

Med units

	Med holding co (TOE 8–57E):											
64	Gren				95	45	95	40	105			200
65	Pistol, cal .45	21	0.056	2	42	21	2					2
66	Rifle, 7.62-mm	160	0.083	43	6,880	100	356	60	214			570
67	Total wt											772
68	STON											0.39
	HHC, med bde (TOE 8–112G):											
69	Gren				66	33	70	28	82	5	14	166
70	Pistol, cal .45	21	0.056	8	168	21	9					9
71	Rifle, 7.62-mm	160	0.083	27	4,360	100	224	60	124			348
72	Total wt											523
73	STON											0.26
	HHD, med gp (TOE 8–122G):											
74	Gren				38	18	38	20	58			96
75	Pistol, cal .45	21	0.056	5	105	21	5					5
76	Rifle, 7.62-mm	160	0.083	20	3,200	160	265					265
77	Total wt											366
78	STON											0.18
	HHD, med bn (TOE 8–126G):											
79	Gren				63	39	82	24	70			152
80	Pistol, cal .45	21	0.056	2	42	21	2					2
81	Rifle, 7.62-mm	160	0.083	16	2,560	100	132	60	79			211
82	Total wt											365
83	STON											0.18
	Med amb co (TOE 8–127G):											
84	Gren				211	48	102	163	425			527
85	Pistol, cal. 45	21	0.056	1	21	21	1					1
86	Rifle, 7.62-mm	160	0.083	50	8,000	100	398	60	265			663
87	Total wt											1,191
88	STON											0.59
	Med clr co (TOE 8–128G):											
89	Gren				136	63	133	73	160			293
90	Pistol, cal .45	21	0.056	4	84	21	4					4
91	Rifle, 7.62-mm	160	0.083	61	9,760	100	489	60	319			808
92	Total wt											1,105
93	STON											0.55
	Med air amb co (TOE 8–137G):											
94	Flare, sur, trip		1.94		250		250	485				485
95	Gren				426	119	252	258	581	49	90	923
96	Pistol, pyrotechnic	48	0.63	26	1,248		48	786				786
97	Revolver, .38 cal	21	0.034	99	2,079	21	70					70
98	Rifle, 7.62-mm	160	0.083	102	16,320	100	816	60	537			1,353
99	Total wt											3,617
100	STON											1.8

Table 5-41. Combat Service Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
			Packed			Carried on indiv		Carried on veh		Bulk loaded		
		Rd per wpn	wt per rd (lb)	Total wpn	Total rd	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Total wt (lb)
	Med units—Continued											
	Med tm, AG, KJ, OA, RA (TOE 8-500G):											
101	Flare, sur, trip		1.94		60			60	116			116
102	Gren				135	36	76	99	248			324
103	Pistol, cal .45	21	0.056	10	210	21	12					12
104	Pistol, pyrotechnic	48	0.63	6	288			48	181			181
105	Revolver, cal .38	21	0.034	26	546	21	17					17
106	Rifle, 7.62-mm	160	0.083	43	6,880	100	360	60	211			571
107	Total wt											1,221
108	STON											0.61
	MASH (TOE 8-571E):											
109	Gren				97	17	36	36	105	44	75	216
110	Pistol, cal .45	21	0.056	8	168	21	9					9
111	Rifle, 7.62-mm	160	0.083	43	6,880	100	356	60	214			570
112	Total wt											795
113	STON											0.40
	Evac hosp (TOE 8-581E):											
114	Gren				220			220	491			491
115	Pistol, cal .45	21	0.056	17	357	21	19					19
116	Rifle, 7.62-mm	160	0.083	108	17,280	100	896	60	537			1,433
117	Total wt											1,943
118	STON											0.97
	Med lab (TOE 8-650E):											
119	Gren				99	56	119	43	126			245
120	Pistol, cal .45	21	0.056	7	147	21	8					8
121	Rifle, 7.62-mm	160	0.083	49	7,840	100	406	60	244			650
122	Total wt											903
123	STON											0.45
	MP units											
	MP bn, army or corps (TOE 19-35G):											
124	Dispersor, riot con agt	64(lb)	2.08	9	576(lb)			64(lb)	1,198			1,198
125	Gren				2,163	592	1,258	1,571	2,727			3,985
126	Gun, mach, cal .50	525	0.395	4	2,100			525	829			829
127	Gun, mach, 7.62-mm	2,200	0.093	9	19,800	440	368	1,760	1,473			1,841
128	Lchr, grcn, 40-mm	10	0.75	36	360			10	270			270
129	Pistol, cal .45	21	0.056	70	1,470	21	82					82
130	Revolver, cal .38	18	0.038	4	72	18	2					2
131	Rifle, 7.62-mm	160	0.083	411	65,760	100	3,378	60	2,079			5,457

132	Rifle, 7.62-mm, with bipod	760	0.083	115	87,400	160	1,513	420	3,974	180	1,766	7,253
133	Rkt, 66-mm, M72		7.80		27	9	70	18	140			210
134	Total wt											21,127
135	STON											10.6
	MP co (TOE 19-57G):											
136	Disperser, ptbl, riot con	64(lb)	2.08	3	192(lb)			64(lb)	399			399
137	Gren				929	52	110	876	1,221	1	2	1,333
138	Gun, mach, 7.62-mm	2,200	0.093	3	6,600			2,200	613			613
139	Lchr, gren, 40-mm	10	0.75	12	120	10	90					90
140	Pistol, cal .45	21	0.056	21	441	21	25					25
141	Rifle, 7.62-mm	160	0.083	105	16,800	100	878	60	517			1,395
142	Rifle, 7.62-mm, with bipod	760	0.083	29	22,040	160	385	420	1,010	180	433	1,828
143	Rkt, 66-mm, M72		7.80		9	3	23	6	46			69
144	Shotgun, riot, 12-gage	10	0.138	12	120	10	16					16
145	Total wt											5,768
146	STON											2.9
	MP phys scty co (TOE 19-97G):											
147	Disperser, riot con agt	64(lb)	2.08	3	192(lb)					64(lb)	399	399
148	Gren				1,012	141	299	56	164	815	1,037	1,500
149	Gun, mach, 7.62-mm	2,200	0.093	11	24,200			2,200	2,250			2,250
150	Lchr, gren, 40-mm	10	0.75	9	90	10	67					67
151	Pistol, cal .45	21	0.056	13	273	21	15					15
152	Revolver, cal .38	18	0.038	3	54	18	20					20
153	Rifle, 7.62-mm	160	0.083	109	17,440	100	912	60	535			1,447
154	Rifle, 7.62-mm, with bipod	760	0.083	18	13,680	160	239	420	627	180	268	1,134
155	Rifle, 90-mm	6	27.50	3	18			6	495			495
156	Total wt											7,327
157	STON											3.7
	MP gd co (TOE 19-247E):											
158	Disperser, riot con agt	64(lb)	2.08	3	192(lb)					64(lb)	399	399
159	Gren				860	41	87	4	11	815	1,039	1,137
160	Gun, mach, 7.62-mm	2,200	0.093	6	13,200			2,200	1,227			1,227
161	Lchr, gren, 40-mm	10	0.75	9	90	10	67					67
162	Pistol, cal .45	21	0.056	14	294	21	16					16
163	Rifle, 7.62-mm	160	0.083	73	11,680	100	605	60	363			968
164	Rifle, 7.62-mm, with bipod	760	0.083	36	27,360	160	478	420	1,254	180	537	2,269
165	Shotgun, riot, 12-gage	10	0.138	18	180	10	24					24
166	Total wt											6,107
167	STON											3.1
	HHD, MP bde (TOE 19-262G):											
168	Gren				89			89	216			216
169	Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409			409
170	Lchr, gren, 40-mm	10	0.75	3	30			3	22			22
171	Pistol, cal .45	21	0.056	18	294	21	21					21
172	Revolver, cal .38	18	0.034	2	36	18	1					1

Table 5-41. Combat Service Support Units—Basic Load of Ammunition—Continued

1	Unit and type of munition	2	3	4	5	6	7	8	9	10	11	12
		Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indiv		Carried on veh		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	MP units—Continued											
173	Rifle, 7.62-mm	160	0.083	41	6,240	100	350	60	194			544
174	Rkt, 66-mm, M72		7.80		3	1	7	2	15			22
175	Total wt											1,235
176	STON											0.62
	MP tms AD, LC (TOE 19-500E):											
177	Gren				59	29	61	29	59	1	2	122
178	Pistol, cal .45	21	0.056	7	147	21	8					8
179	Revolver, cal .38	18	0.038	22	396	18	12					12
180	Rifle, 7.62-mm	160	0.083	15	2,400	100	125	60	74			199
181	Rifle, 7.62-mm, with bipod	760	0.083	4	3,040	160	53	420	139	180	60	252
182	Total wt											593
183	STON											0.30
	S&S units											
	QM air dlvr co (TOE 10-407G):											
184	Gren				440	267	567	106	311	67	143	1,021
185	Gun, mach, 7.62-mm	2,200	0.093	6	13,200			1,100	613	1,100	613	1,226
186	Pistol, cal .45	21	0.056	1	21	21	1					1
187	Rifle, 7.62-mm	160	0.083	247	39,520	100	2,050	60	1,230			3,280
188	Rifle, 7.62-mm, with bipod	740	0.083	19	14,060	140	220	360	567	240	378	1,165
189	Rkt, 66-mm, M72		7.80		15	5	39	10	78			117
190	Total wt											6,810
191	STON											3.4
	Fld svc GS co, fwd (TOE 29-114G):											
192	Gren				442	305	648	96	282	41	66	996
193	Gun, mach, 7.62-mm	2,200	0.093	9	19,800			2,200	1,841			1,841
194	Lchr, gren, 40-mm	10	0.75	1	10	10	7					7
195	Pistol, cal .45	21	0.056	1	21	21	1					1
196	Rifle, 7.62-mm	160	0.083	282	45,120	100	2,340	60	1,404			3,744
197	Rifle, 7.62-mm, with bipod	760	0.083	22	16,720	160	292	420	766	180	328	1,386
198	Rkt, 66-mm, M72		7.80		24	8	62	16	124			186
199	Total wt											8,161
200	STON											4.1
	HHC, S&S GS bn, fwd (TOE 29-116F):											
201	Gren				185	92	195	32	94	61	125	414
202	Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409			409

203	Lchr, gren, 40-mm	10	0.75	1	10	10	7						7
204	Pistol, cal .45	21	0.056	5	105	21	5						5
205	Rifle, 7.62-mm	160	0.083	86	13,760	100	713	60	428				1,141
206	Rkt, 66-mm, M72		7.80		12	4	31	8	62				93
207	Total wt												2,069
208	STON												1.0
	Gen sup GS co (TOE 29-118G):												
209	Gren				332	208	442	108	263	16	47		752
210	Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409				409
211	Lchr, gren, 40-mm	10	0.75	10	100	10	75						75
212	Pistol, cal .45	21	0.056	1	21	21	1						1
213	Rifle, 7.62-mm	160	0.083	207	33,120	100	1,718	60	1,030				2,748
214	Rifle, 7.62-mm, with bipod	760	0.083	6	4,560	160	79	420	209	180	89		377
215	Rkt, 66-mm, M72		7.80		3	1	7	2	15				22
216	Total wt												4,384
217	STON												2.2
	Rep parts GS co, fwd (TOE 29-119G):												
218	Gren				360	226	480	72	211	62	128		819
219	Gun, mach, 7.62-mm	2,200	0.093	4	8,800			2,200	818				818
220	Lchr, gren, 40-mm	10	0.75	4	40	10	30						30
221	Pistol, cal .45	21	0.056	1	21	21	1						1
222	Rifle, 7.62-mm	160	0.083	213	34,080	100	1,767	60	1,060				2,827
223	Rifle, 7.62-mm, with bipod	760	0.083	12	9,120	160	159	420	418	180	179		756
224	Rkt, 66-mm, M72		7.80		3	1	7	2	15				22
225	Total wt												5,273
226	STON												2.6
	Rep parts GS co, army (TOE 29-119G):												
227	Gren				360	226	480	72	211	62	128		819
228	Gun, mach, 7.62-mm	2,200	0.093	5	11,000			2,200	1,023				1,023
229	Lchr, gren, 40-mm	10	0.75	6	60	10	45						45
230	Pistol, cal .45	21	0.056	1	21	21	1						1
231	Rifle, 7.62-mm	160	0.083	261	41,760	100	2,162	60	1,060				3,222
232	Rifle, 7.62-mm, with bipod	760	0.083	15	11,400	160	199	420	418	180	179		796
233	Rkt, 66-mm, M72		7.80		3	1	7	2	15				22
234	Total wt												5,928
235	STON												2.9
	Fld svc GS co, army (TOE 29-124G):												
236	Gren				326	222	480	62	182	42	69		731
237	Gun, mach, 7.62-mm	2,200	0.093	8	17,600			2,200	1,636				1,636
238	Lchr, gren, 40-mm	10	0.75	1	10	10	7						7
239	Pistol, cal .45	21	0.056	1	21	21	1						1
240	Rifle, 7.62-mm	160	0.083	283	45,280	100	2,348	60	1,409				3,757
241	Rifle, 7.62-mm, with bipod	760	0.083	10	7,600	160	132	420	348	180	149		629
242	Rkt, 66-mm, M72		7.80		21	7	54	14	109				163
243	Total wt												6,924
244	STON												3.5

Table 5-41. Combat Service Support Units—Basic Load of Ammunition—Continued

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type of munition	Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indiv		Carried on veh		Bulk loaded		Total wt (lb)
					Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
S&S units—Continued											
HHC, S&S GS bn, army (TOE 29-126G):											
245 Gren				187	92	195	34	99	61	125	419
246 Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409			409
247 Lchr, gren, 40-mm	10	0.75	1	10			10	7			7
248 Pistol, cal .45	21	0.056	5	105	21	5					5
249 Rifle, 7.62-mm	160	0.083	87	13,920	100	728	60	427			1,155
250 Rkt, 66-mm, M72		7.80		6	2	15	4	31			46
251 Total wt											2,041
252 STON											1.0
Hv mat sup GS co (TOE 29-127G):											
253 Gren				302	187	397	110	269	5	14	680
254 Gun, mach, 7.62-mm	2,200	0.093	4	8,800			2,200	818			818
255 Lchr, gren, 40-mm	10	0.75	1	10	10	7					7
256 Pistol, cal .45	21	0.056	1	21	21	1					1
257 Recov veh, mdm, M88			2								
258 Rifle, 7.62-mm	160	0.083	187	29,920	100	1,564	60	919			2,483
259 Rifle, 7.62-mm, with bipod	760	0.083	12	9,120	160	159	420	418	180	179	756
260 Rkt, 66-mm, M72		7.80		12	4	31	8	62			93
261 Total wt											4,838
262 STON											2.4
Invt con co, FASCOM (TOE 29-402T):											
263 Gren				482	363	771	64	188	55	108	1,067
264 Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409			409
265 Lchr, gren, 40-mm	10	0.75	2	20	10	15					15
266 Pistol, cal .45	21	0.056	30	630	21	35					35
267 Rifle, 7.62-mm	160	0.083	333	53,280	100	2,763	60	1,658			4,421
268 Rkt, 66-mm, M72		7.80		9	3	23	6	46			69
269 Total wt											6,016
270 STON											3.0
HHC, avn bn (TOE 1-256G):											
271 Armt subsys, 7.62-mm, M2	6,500	0.093	3	19,500			1,300	362	5,200	1,450	1,812
272 Gren				192	76	161	52	131	64	185	477
273 Gun, mach, 7.62-mm	2,200	0.093	3	6,600			2,200	613			613
274 Lchr, gren, 40-mm	10	0.75	8	80	10	60					60
275 Pistol, cal .45	21	0.056	13	273	21	15					15
276 Pistol, pyrotechnic	48	0.63	1	48			48	30			30

277	Revolver, cal .38	21	0.034	11	231	21	8						8
278	Rifle, 7.62-mm	160	0.083	51	8,160	100	407	60	244				651
279	Rkt, 66-mm, M72		7.80		9	3	23	6	46				69
280	Total wt												3,735
281	STON												1.9
	Avn mdm hel co (TOE 1-258G):												
282	Armt subsys, 7.62-mm, M23	4,200	0.093	16	67,200			1,200	1,812	3,000	4,438		6,250
283	Flare, sur, trip		1.94		180			180	349				349
284	Gren				392	162	344	182	407	48	87		838
285	Gun, mach, 7.62-mm	2,200	0.093	4	8,800			2,200	818				818
286	Lchr, gren, 40-mm	10	0.75	18	180			10	135				135
287	Pistol, cal .45	21	0.056	2	42	21	1						1
288	Pistol, pyrotechnic	48	0.63	2	96			48	60				60
289	Revolver, cal .38	21	0.034	54	1,134	21	39						39
290	Rifle, 7.62-mm	160	0.083	183	29,280	100	904	60	542				1,446
291	Rkt, 66-mm, M72		7.80		6	2	15	4	31				46
292	Total wt												9,982
293	STON												5.0
	HHD, trans MCC (TOE 55-6F):												
294	Gren				326	166	352	70	205	90	211		768
295	Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409				409
296	Lchr, gren, 40-mm	10	0.75	4	40	10	30						30
297	Pistol, cal .45	21	0.056	15	315	21	17						17
298	Rifle, 7.62-mm	160	0.083	152	24,320	100	1,261	60	756				2,017
299	Rkt, 66-mm, M72		7.80		6	2	15	4	31				46
300	Total wt												3,287
301	STON												1.6
	HHD, TMT bn (TOE 55-16G):												
302	Gren				63	41	87	16	47	6	17		151
303	Gun, mach, 7.62-mm	2,200	0.093	2	4,400			2,200	409				409
304	Lchr, gren, 40-mm	10	0.75	3	30	10	22						22
305	Pistol, cal .45	21	0.056	7	147	21	8						8
306	Rifle, 7.62-mm	160	0.083	35	5,600	100	293	60	172				465
307	Rkt, 66-mm, M72		7.80		6	2	15	4	31				46
308	Total wt												1,101
309	STON												0.55
	Trans lt trk co (5-ton) (TOE 55-17G):												
310	Gren				292	172	365			120	299		664
311	Gun, mach, 7.62-mm	2,200	0.093	15	33,000			2,200	3,069				3,069
312	Lchr, gren, 40-mm	10	0.75	7	70	10	52						52
313	Pistol, cal .45	21	0.056	8	168	21	9						9
314	Rifle, 7.62-mm	160	0.083	171	27,360	100	1,419	60	851				2,270
315	Rkt, 66-mm, M72		7.80		6	2	15	4	31				46
316	Total wt												6,110
317	STON												3.1

Table 5-41. Combat Service Support Units—Basic Load of Ammunition—Continued

1	1 Unit and type of munition	2 Rd per wpn	3 Packed wt per rd (lb)	4 Total wpn	5 Total rd	6 Carried on indiv: Rd per wpn	7 Carried on indiv: Total wt (lb)	8 Carried on veh: Rd per wpn	9 Carried on veh: Total wt (lb)	10 Bulk loaded: Rd per wpn	11 Bulk loaded: Total wt (lb)	12 Total wt (lb)
	S & S units—Continued											
	Trans mdm trk co (cgo) (TOE 55-18G):											
318	Gren					367	184	391	142	417	41	66	874
319	Gun, mach, 7.62-mm	2,200	0.093	12	26,400			2,200	2,455			2,455
320	Lchr, gren, 40-mm	10	0.75	7	70	10	52					52
321	Pistol, cal .45	21	0.056	8	168	21	9					9
322	Rifle, 7.62-mm	160	0.083	175	28,000	100	1,464	60	860			2,324
323	Rkt, 66-mm, M72		7.80		12	4	31	8	62			93
324	Total wt											5,807
325	STON											2.9
	Trans car co, army (TOE 55-19E):											
326	Gren					213	34	72	138	405	41	66	543
327	Gun, mach, 7.62-mm	2,200	0.093	12	26,400			2,200	2,455			2,455
328	Lchr, gren, 40-mm	10	0.75	5	50	10	37					37
329	Pistol, cal .45	21	0.056	6	126	21	7					7
330	Rifle, 7.62-mm	160	0.083	101	16,160	100	838	60	502			1,340
331	Rkt, 66-mm, M72		7.80		6	2	15	4	31			46
332	Total wt											4,428
333	STON											2.2
	Trans lt-mdm trk co (TOE 55-67G):											
334	Gren					407	197	418	168	493	42	69	980
335	Gun, mach, 7.62-mm	2,200	0.093	16	35,200			2,200	3,273			3,273
336	Lchr, gren, 40-mm	10	0.75	8	80	10	60					60
337	Pistol, cal .45	21	0.056	9	189	21	10					10
338	Rifle, 7.62-mm	160	0.083	193	30,880	100	1,560	60	1,002			2,562
339	Rkt, 66-mm, M72		7.80		6	2	15	4	31			46
340	Total wt											6,931
341	STON											3.5
	Trans tml trf co (TOE 55-118G):											
342	Gren					419	264	561	154	399	1	2	962
343	Gun, mach, 7.62-mm	2,200	0.093	10	22,000			2,200	2,024			2,024
344	Lchr, gren, 40-mm	10	0.75	10	100	10	75					75
345	Pistol, cal .45	21	0.056	9	189	21	10					10
346	Rifle, 7.62-mm	160	0.083	257	41,120	100	2,172	60	1,240			3,412
347	Rkt, 66-mm, M72		7.80		24	8	62	16	124			186
348	Total wt											6,669
349	STON											3.3

Table 5-42. Combat Service Support Units—Basic Load of Ammunition Summary

1	1 Weapon	2 Rounds per weapon: Secure area	3 Rounds per weapon: Area of guerrilla activity
2	Gun, mach, cal .30	1,500	2,000
3	Gun, mach, cal .50, Browning, hv bbl, flex	420	525
4	Gun, mach, 7.62-mm, ltwt, GP	1,760	2,200
5	Gun, submachine, cal .45	60	90
6	Lchr, rkt, 3.5-in	3	3
7	Pistol, semiauto, cal .45	21	21
8	Rifle, 5.56-mm	240	500
9	Rifle, auto-semiauto, 7.62-mm, selective, hv bbl	260	50
		260	500
10	Rifle, semiauto, 7.62-mm, lt bbl	100	160
11	Rifle, 7.62-mm	96	144

SECTION VI. MISCELLANEOUS SUPPLY

5-20. Water Supply

Tables 5-43 through 5-46 are extracted from FM 5-35 and TM 5-700.

Table 5-43 Water Requirements

1	1 Unit consumer	2 Conditions of use	3 Gallons per unit consumer per day: Temperate/cold climate	4 Gallons per unit consumer per day: Desert/jungle	5 Remarks
2	Man	In combat:			
		Minimum	½-1	2-3	For eating and drinking only; periods not to exceed 3 days.
			2	3-4	When field rations are used.
		Normal	3	6	Drinking plus small amount for cooking or personal hygiene.
		March or bivouac	2	5	Minimum for all purposes.
		Temporary camp	5		Desirable for all purposes (does not include bathing).
		Temporary camp with bathing facilities.	15		Includes allowance for water-borne sewerage system.
		Semipermanent camp	30-60		
		Permanent camp	60-100		
3	Vehicle	Level and rolling country	⅛-½		Depending on size of vehicle.
		Mountainous country	¼-1		Depending on size of vehicle.
4	Locomotive	Standard military	Variable		95 gallons per train-kilometer.
		Commercial	Variable		125 gallons per train-kilometer.
5	Hospital	Standard 2	50 per bed		Includes water for medical personnel; sewage not water-borne.
		Standard 3, 4, 6	85 per bed		Includes water for medical personnel; and for water-borne sewage.
6	Impregnating plant, clothing.	Maximum impregnating capacity.	2,400		Aqueous process. Includes 2,000 gallons for washing and cleaning purposes.
7	Bakery unit	Two 10-hour shifts	2,600		Water for making bread and cleaning baking utensils.
8	Laundry unit	Two 10-hour shifts	64,000 (4,000 per unit).		
9	Clothing exchange and bath unit.	Two 10-hour shifts	360,000 (60,000 per unit).		
10	Decontaminating 400-gallon, truck-mounted.	Decontamination	4,000		Water obtained from natural source when available.
11	Chemical base laboratory M2.	Normal laboratory work	300		

Table 5–44. Water Equipment Issued to Engineer Units

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit	TOE	Number of sets [1]	Type of purification unit (fresh water) (gph)	Generator (kw)	Equipment in each set: Tank: Number	Equipment in each set: Tank: Capacity (gal)	Pump discharge (gpm per set) [2]: Distribution	Pump discharge (gpm per set) [2]: Purification	Total storage capacity (gal)	Maximum production (gph)	Water transport equip
2	Engr bn, abn div	5–25G	5	600	3	2	1,000	65	10	5,000	3,000	
3	Engr cbt bn, army or corps.	5–35G	5	1,500	10	2	6,000	125	25	30,000	7,500	
4	Engr WS co	5–67G	9	3,000 (mbl)	10	2	6,000	125	50	54,000	27,000	12 1,000-gal tk trk.
5	Engr co, sep inf bde	5–107G	2	1,500	10	2	6,000	125	25	12,000	3,000	HEA 2000 gal semi TRLR.
6	Engr CB	5–115G	2	1,500	10	2	6,000	125	25	12,000	3,000	
7	Engr co, sep armd or inf (mech) bde.	5–127G	2	1,500	10	2	6,000	125	25	12,000	3,000	
8	Engr co, sep abn bde	5–137G	1	600	3	2	1,000	65	10	1,000	600	
9	Engr bn, armd and inf (mech) div.	5–145G	5	1,500	10	2	6,000	125	25	30,000	7,500	
10	Engr bn, inf div	5–155G	5	1,500	10	2	6,000	125	25	30,000	7,500	
11	Engr cbt bn, abn	5–195G	3	600 (mbl)							1,800	
12	Engr co, sep lt inf bde	5–207G	2	1,500 (mbl)							3,000	
13	Engr bn, airmbl div	5–215T	5	500 (mb.)							2,500	
14	Well-drilling tm, abn (GF)	5–520G	1	Well-drilling set.								
15	Water purification tm (CG).	5–520G	1	3,000 (base)	10	3	3,000	125	50	9,000	3,000	
16	Water purification tm (GH).	5–520G	4	3,000 (base)	10	12	3,000	125	50	3,000	12,000	
17	Water trans tm (GJ)	5–520G										5 1,000-gal tk trk.
18	Water distillation tm (GK).	5–520G	1	6,000							6,000	

[1] Each set can equip one water point.

[2] One pump at steady purification rate; others at full-rated capacity for distribution (intermittent operation).

Table 5-45. Water Distribution Equipment

1	1 Line item number	2 Equipment	3 Capacity
	S73120	Stlr, tk, water, 2-wheel:	
2	----------	With 2½-ton trk, trac	2,000 gal
3	----------	With unit ki	5-gal cans, wt 50 lb (filled)
4	S73257	Stlr, tk, potable water, 4-2h331, forced disch	5,000 gal
5	W95811	Tlr, cgo, 1½-ton, 2-wheel	60 cans filled
6	W98962	Tlr, tk, water, 2-wheel	400 gal
7	X40009	Trk, cgo, 2½-ton, 6X6	100 cans filled
8	X58367	Trk, tk, water, 2½-ton, 6X6	1,000 gal

Table 5-46. Capacities of Other Water Supply Equipment

1	1 Line item	2 Equipment	3 Capacity
2	G58426	Drill, mach, well, rot	4⅞-in.-diam well at 600 ft.
3	G58563	Drill, mach, percussion	6-in-diam well at 1,000 ft.
4	G58597	Drill, mach, well	5 ⅞-in.-diam well at 1,500 ft.
5	P91756	Pump, cntrf, 1½-in. suction and disch	65 gpm at 50-ft head.
6	P92167	Pump, cntrf, 2-in. suction and disch	170 gpm at 50-ft head.
7	P92578	Pump, cntrf, 3-in. suction and disch	240 gpm at 60-ft head.
8	P92989	Pump, cntrf, 4-in. suction and disch	200 gpm at 300-ft head.
9	P93400	Pump, cntrf, 6-in. suction and disch	500 gpm at 555-ft head; 1,400 gpm at 275-ft head.
10	P96503	Pumping assy, deep-well	50 gpm against 250-ft head.
11	P96914	Pumping assy, 4-in	200 gpm against 200-ft head.

5-21. Personnel Services and Supplies

a. Table 5-47 gives printing rates compiled from commercial sources of information.

b. Tables 5-48 through 5-51 are based on experience data contained in previous editions of this manual.

Table 5-47. Printing Rates

1	1 Duplicating method	2 Number of copies	3 Copies per minute
2	Stencil	10, 000	90-180
3	Multigraph	Unlimited	100
4	Multilith (paper master)	300-1, 000	100
5	Multilith (metal master)	10, 000	100
6	Photo-offset	Unlimited	150
7	Heavy press	Unlimited	600

Table 5-48. Adjutant General Supplies

1	1 Item	2 Lb per man per day	3 STON per 1,000 men per mo	4 MTON per 1,000 men per mo	5 Sacks or pouches of mail per 1,000 men per mo
	Forms and publications:				
2	Total forms and publications	0. 033	0. 500	1. 00	----------
	Postal:				
3	Letter mail [a]	0. 028	0. 421	[b] 2. 41	[c] 24. 0
4	Parcel post [d]	0. 166	2. 490	[e] 15. 56	----------
5	Postal supplies	0. 011	0. 171	[f] 0. 60	----------
6	Total postal	0. 205	3. 082	18. 57	[g] 124. 5

[a] Moved by air. [b] Computed at 10 pouches per MTON (est). [c] Computed at 85 lb per pouch of mail (est).
[d] Volume may be expected to increase 2.3 times during October and November because of Christmas mail.
[e] Computed at 8 sacks per MTON (est). [f] Conversion factor 3.5 MTON per STON (est). [g] Computed at 40 lb per sack of mail (est).

Table 5-49. Army Exchange Supplies—Consumption and Replenishment

	1	2	3	4
1	Item	Lb per man per day	STON per man per mo	MTON per man per mo
	Combat zone:			
2	Army in amph op [a]	[b] 0. 533	[b] 0. 008	[b] 0. 020
	Theater:			
3	European [c] [d]	1. 428	0. 021	0. 043
4	Pacific [c] [e]	1. 571	0. 024	0. 050

[a] Based on Operation Olympic estimates, 150-day period.
[b] Does not include sundries pack issued with rations, 0.369 lb per man per day.
[c] Data do not include items procured locally by individual exchanges.
[d] ETO Board Report.
[e] Southwest Pacific theater planning data, 1945.

Table 5-50. Special Services Supplies

	1	2	3
1	Item	STON per 10,000 men per mo	MTON per 10,000 men per mo
	Donated items:		
2	Total donated items	0. 15	0. 5
	Recreational:		
3	Books and magazines*	0. 75	1. 0
4	Music, theatrical, crafts, and misc.*	1. 00	2. 0
5	Sports*	0. 75	2. 0
6	Total recreational*	2. 50	5. 0

*Data do not include items procured locally or items procured from any source with nonappropriated funds as defined in AR 230-5.

Table 5-51. Entertainment Motion-Picture Service Supplies

	1	2	3
1	Item	STON per 25,000 men per mo	MTON per 25,000 men per mo
2	Total misc equip and sup	0. 152	0. 247

Section VII. SUPPLY REQUIREMENTS

5-22. Day of Supply—Definition

The day of supply, as used in this section, is the estimated weight of supplies required to support one man in an oversea theater for 1 day, based on total strengths and maintenance tonnage experience over a long period. These factors do not include initial equipment of troop units, but they do include tonnages for project equipment and similar supplies (other than civilian or other relief supplies) that are required to support troops. Tables 5-52 through 5-60 supplement the general consumption and flow charts in figures 5-1 through 5-6. Both the tables and the charts are based on historical data for specific locations, specific types of combat, and specific ground-to-air troop ratios. For information on the establishment of ammunition day of supply and specification of theater stockage levels, see SB 38-26 and AR 11-8.

5-23. General Consumption and Flow Charts—Introduction and Explanation

a. This paragraph illustrates, with a series of six graphical charts (fig. 5-1 through 5-6), the flow of replacement and consumption supplies from the continental United States (CONUS) or local procurement to consumer groups in the theater of operations based on latest organizations and on unit strengths in paragraph 4-2.

b. The unit of measure, STON per division slice, is considered the most appropriate for long-range planning for supply of the Army and Air Force in a theater of operations. The division slice is defined (para 4-6) as including the strength of an average division plus proportionate shares of the total corps, field army zone, and theater overhead units. A troop location ratio has been assumed, illustrated by the human silhouettes shown in figure 5-1. Each silhouette represents approximately 10,000 of the 51,955 men making up the theater division slice. For illustrative purposes in the charts (fig. 5-1 through 5-6), the assumption is that all divisions in the theater are occupying sectors along the front. In practice, varying proportions of these troops will be in reserve, in rest areas, in transit, or in staging. Also shown in a similar manner is the proportionate air strength in the theater, based on a ratio of two air wing slices (defined in para 4-6) per division slice.

c. The charts include, besides the supplies consumed by the Army in the theater, the quantities of supplies brought into the theater for the use of the U.S. Air Force. All are shown in terms of STON per division slice per day. In all instances figures based on Air Force strength include those Army troops, part of the air wing slice, required in the theater because of the presence of Air Force elements, which are provided Army combat service support. A horizontal dotted line (fig. 5–1) separates the quantity of supplies brought into the theater for the Army from those supplies brought in for the Air Force.

d. The flow of supplies, in terms of STON per division slice per day, shown in each of the charts is supported by pounds-per-man-per-day data indicated beneath each chart.

e. Procurement in the theater is indicated in each chart, except for classes V and V(A), as a possible source of supply. The quantity thus available would decrease proportionately the amount to be procured from the CONUS.

f. Buildup of theater levels is not included in this series of charts. However, this buildup can be determined by a fractional increase in the amounts shown. For example, if it is desired to establish a theater reserve of 30 days of supply, and accomplish this buildup in 120 days, a fractional increase of 30/120, or one-fourth, can be made in the amounts shown here.

5–24. Supply Data Based on World War II and Korean War Experience

The tables in this paragraph are included unchanged from previous editions of the manual to provide experience data that may be adaptable to future operations. The tables are based on historical data pertaining to—

a. The European theater (table 5–52).
b. The Pacific theater (table 5–53).
c. The Far East theater (table 5–54).
d. The polar regions (table 5–55).
e. The combat zone and the COMMZ (table 5–56).
f. The field army and corps in combat (table 5–57).
g. The airborne division in an airborne assault (table 5–58).
h. The armored division (table 5–59).
i. The infantry division (table 5–60).

Table 5–52. European Theater

1	1 Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON [1]	5 MTON per man per mo	6 MTON per man per mo with 15-percent stowage factor
2	Cl I—rat	7. 170	0. 108	2. 1	0. 227	0. 261
	Cl II:					
3	QM clo and equipage	0. 426	0. 006	2. 0	0. 012	0. 014
4	QM gen sup	0. 305	0. 005	2. 8	0. 014	0. 016
5	Ord veh repl	0. 620	0. 009	2. 2	0. 020	0. 023
6	Engr	0. 630	0. 009	3. 3	0. 030	0. 035
7	Ord	2. 710	0. 041	1. 8	0. 074	0. 085
8	Cml (incl cl IV)	0. 120	0. 002	2. 3	0. 005	0. 006
9	Sig (incl cl IV)	0. 725	0. 011	3. 8	0. 042	0. 048
10	Med (incl cl IV)	0. 300	0. 005	2. 5	0. 013	0. 015
11	Total cl II	5. 836	0. 088	----------	0. 210	0. 242
	Cl III:					
	Bulk: [2]					
12	MOGAS	9. 100	0. 137	1. 5	0. 206	0. 237
13	Diesel fuel	1. 420	0. 021	1. 5	0. 032	0. 037
14	Army AVGAS	0. 640	0. 010	1. 5	0. 015	0. 017
15	Heating fuel	6. 500	0. 098	1. 5	0. 147	0. 169
16	Subtotal	17. 660	0. 266	----------	0. 400	0. 460

See footnotes at end of table.

Table 5-52. European Theater—Continued

1	1 Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON [1]	5 MTON per man per mo	6 MTON per man per mo with 15-percent sto factor
	Packaged: [3]					
17	MOGAS [4]	0. 600	0. 009	1. 5	0. 014	0. 016
18	Diesel fuel [4]	0. 080	0. 001	1. 5	0. 002	0. 002
19	Army AVGAS	0. 040	0. 001	1. 5	0. 002	0. 002
20	Heating fuel [4]	0. 430	0. 006	1. 5	0. 009	0. 010
21	Eng oil	0. 300	0. 005	1. 5	0. 008	0. 009
22	Gear lub	0. 060	0. 001	1. 5	0. 002	0. 002
23	Greases	0. 030	Negligible	1. 5	Negligible	Negligible
24	AAVN greases and lubs	0. 020	Negligible	1. 5	Negligible	Negligible
25	Other	0. 150	0. 002	1. 5	0. 003	0. 003
26	Subtotal	1. 710	0. 025	----------	0. 040	0. 044
27	Total cl III	19. 370	0. 291	----------	0. 440	0. 504
	Cl IV: [5]					
28	Ord mtr maint	0. 510	0. 008	1. 0	0. 008	0. 009
29	QM sales items	2. 000	0. 030	1. 7	0. 051	0. 059
30	AF sup and repl	2. 840	0. 043	4. 0	0. 172	0. 198
31	Engr const mat	7. 280	0. 109	1. 5	0. 164	0. 189
32	Trans	0. 140	0. 002	2. 4	0. 005	0. 006
33	Total cl IV	12. 770	0. 192	--------	0. 400	0. 461
	Cl V:					
34	Ammo (less AF)	3. 640	0. 055	0. 9	0. 050	0. 058
35	AF ammo	4. 410	0. 066	0. 9	0. 059	0. 068
36	Cml	0. 110	0. 002	0. 9	0. 002	0. 002
37	Total cl V	8. 160	0. 123	------	0. 111	0. 128
38	Total	53. 306	0. 802	--------	1. 388	1. 596

[1] Conversion factors are based on average cubage for each item. MTON (40 cu ft) of any one item can be found by multiplying its STON weight (2,000 lb) by that item's conversion factor.
[2] Represents 95 percent of total theater daily consumption factor.
[3] Includes weight of product and packing.
[4] Represents 5 percent of total theater daily consumption factor.
[5] Class IV chemical, medical, and signal included in class II.

Table 5-53. Pacific Theater

1	1 Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON [1]	5 MTON per man per mo	6 MTON per man per mo with 15-percent stowage factor
2	Cl I—rat	6. 710	0. 101	2. 1	0. 212	0. 244
	Cl II:					
3	QM clo and equipage	1. 000	0. 015	2. 0	0. 030	0. 035
4	QM gen sup	0. 730	0. 011	2. 8	0. 031	0. 036
5	Ord veh repl	0. 620	0. 009	2. 2	0. 020	0. 023
6	Engr	0. 370	0. 006	3. 3	0. 020	0. 023
7	Ord	0. 300	0. 005	1. 8	0. 009	0. 010

See footnotes at end of table.

Table 5-53. Pacific Theater—Continued

1	Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON [1]	5 MTON per man per mo	6 MTON per man per mo with 15-percent stowage factor
8	Cml (incl cl IV)	0. 440	0. 007	2. 3	0. 016	0. 018
9	Sig (incl cl IV)	0. 750	0. 011	3. 8	0. 042	0. 048
10	Med (incl cl IV)	0. 333	0. 005	2. 5	0. 013	0. 015
11	Total cl II	4. 543	0. 069		0. 181	0. 208
	Cl III:					
	Bulk: [2]					
12	MOGAS	5. 000	0. 075	1. 5	0. 113	0. 130
13	Diesel fuel	1. 420	0. 021	1. 5	0. 032	0. 037
14	Army AVGAS	0. 640	0. 010	1. 5	0. 015	0. 017
15	Heating fuel	5. 700	0. 086	1. 5	0. 129	0. 148
16	Subtotal	12. 760	0. 192		0. 289	0. 332
	Packaged: [3]					
17	MOGAS [4]	0. 250	0. 004	1. 5	0. 006	0. 007
18	Diesel fuel [4]	0. 080	0. 001	1. 5	0. 002	0. 002
19	Army AVGAS	0. 040	0. 001	1. 5	0. 002	0. 002
20	Heating fuel [4]	0. 370	0. 006	1. 5	0. 009	0. 010
21	Eng oil	0. 300	0. 005	1. 5	0. 008	0. 009
22	Gear lub	0. 060	0. 001	1. 5	0. 002	0. 002
23	Greases	0. 030	Negligible	1. 5	Negligible	Negligible
24	AAVN greases and lubs	0. 030	Negligible	1. 5	Negligible	Negligible
25	Other	0. 150	0. 002	1. 5	0. 003	0. 003
26	Subtotal	1. 310	0. 020		0. 032	0. 035
27	Total cl III	14. 070	0. 212		0. 321	0. 367
	Cl IV: [5]					
28	Ord mtr maint	0. 180	0. 003	1. 0	0. 003	0. 003
29	QM sales items	1. 970	0. 030	1. 7	0. 051	0. 059
30	AF sup and repl	2. 840	0. 043	4. 0	0. 172	0. 198
31	Engr const mat	11. 900	0. 179	1. 5	0. 268	0. 306
32	Trans	0. 130	0. 002	2. 4	0. 005	0. 006
33	Total cl IV	17. 020	0. 257		0. 499	0. 572
	Cl V:					
34	Ammo (less AF)	5. 140	0. 077	0. 9	0. 070	0. 081
35	AF ammo	3. 470	0. 052	0. 9	0. 047	0. 054
36	Cml	0. 090	0. 002	0. 9	0. 002	0. 002
37	Total cl V	8. 700	0. 131		0. 119	0. 137
38	Total	51. 043	0. 770		1. 332	1. 528

[1] Conversion factors are based on average cubage for each item. MTON (40 cu ft) of any one item can be found by multiplying its STON weight (2,000 lb) by that item's conversion factor.

[2] Represents 95 percent of total theater daily consumption factor.

[3] Includes weight of product and packing.

[4] Represents 5 percent of total theater daily consumption factor.

[5] Class IV chemical, medical, and signal included in class II.

Table 5-54. Far East Theater—Class III

1	1 Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON [1]	5 MTON per man per mo	6 MTON per man per mo with 15-percent stowage factor
	Cl III:					
	Bulk: [2]					
2	MOGAS	8.600	0.129	1.5	0.194	0.233
3	Diesel fuel	1.420	0.021	1.5	0.032	0.037
4	Army AVGAS	0.640	0.010	1.5	0.015	0.017
5	Heating fuel	9.300	0.140	1.5	0.210	0.242
	Subtotal	19.960	0.300		0.451	0.529
	Packaged: [3]					
6	MOGAS [4]	0.500	0.008	1.5	0.012	0.014
7	Diesel fuel	0.080	0.001	1.5	0.002	0.002
8	Army AVGAS	0.040	0.001	1.5	0.002	0.002
9	Heating fuel [4]	0.610	0.009	1.5	0.014	0.016
10	Eng oil	0.400	0.006	1.5	0.009	0.010
11	Gear lub	0.100	0.002	1.5	0.003	0.003
12	Greases	0.040	0.001	1.5	0.002	0.002
13	AAVN greases and lubs	0.020	Negligible	1.5	Negligible	Negligible
14	Other	0.150	0.002	1.5	0.003	0.003
15	Subtotal	1.940	0.030		0.047	0.052
16	Total cl III	21.900	0.330		0.498	0.581

[1] Conversion factors are based on average cubage for each item. MTON (40 cu ft) of any one item can be found by multiplying its STON wieght (2,000 lb) by that item's conversion factor.
[2] Represents 95 percent of total theater daily consumption factor.
[3] Includes weight of product and packing.
[4] Represents 5 percent of total theater daily consumption factor.

Table 5-55. Polar Regions [1]

1	1 Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON [2]	5 MTON per man per mo	6 MTON per man per mo with 15-percent stowage factor
2	Cl I—rations	10.400	0.156	2.1	0.328	0.377
	Cl II:					
3	QM clo and equipage	0.850	0.013	2.9	0.038	0.044
4	QM gen sup	0.400	0.006	2.8	0.017	0.020
5	Ord veh repl	0.620	0.009	2.2	0.020	0.023
6	Engr	0.840	0.013	3.3	0.043	0.049
7	Ord	2.000	0.030	1.8	0.054	0.062
8	Cml (incl cl IV)	0.012	0.002	2.3	0.005	0.006
9	Sig (incl cl IV)	0.660	0.010	3.8	0.038	0.044
10	Med (incl cl IV)	0.400	0.006	2.5	0.015	0.017
11	Total cl II	5.782	0.089		0.230	0.265

See footnotes at end of table.

Table 5-55. Polar Regions[1]—Continued

1	Item	2 Lb per man per day	3 Tons per man per mo	4 Conversion factor STON to MTON[2]	5 MTON per man per mo	6 MTON per man per mo with 15-percent stowage factor
	Cl III:					
	Bulk:[3]					
12	MOGAS	10.890	0.163	1.5	0.245	0.282
13	Diesel fuel	1.420	0.021	1.5	0.032	0.037
14	Army AVGAS	0.640	0.010	1.5	0.015	0.017
15	Heating fuel	17.100	0.257	1.5	0.386	0.444
16	Subtotal	30.050	0.451	----------	0.678	0.780
	Packaged:[4]					
17	MOGAS[5]	0.710	0.011	1.5	0.017	0.020
18	Diesel fuel	0.080	0.001	1.5	0.002	0.002
19	Army AVGAS	0.040	0.001	1.5	0.002	0.002
20	Heating fuel	0.900	0.014	1.5	0.021	0.024
21	Eng oil	0.800	0.012	1.5	0.018	0.021
22	Gear lub	0.200	0.003	1.5	0.005	0.006
23	Greases	0.050	0.001	1.5	0.002	0.002
24	AAVN greases and lubs	0.020	Negligible	1.5	Negligible	Negligible
25	Other	0.150	0.002	1.5	0.003	0.003
	Subtotal	2.950	0.045	----------	0.070	0.080
27	Total cl III	33.000	0.496	----------	0.748	0.860
	Cl IV:[6]					
28	Ord mtr maint	0.500	0.008	1.0	0.008	0.009
29	QM sales items	2.000	0.030	1.7	0.051	0.059
30	AF supply and repl[7]	3.500	0.052	4.0	0.208	0.239
31	Engr const mat	12.000	0.180	1.5	0.270	0.310
32	Trans	0.140	0.002	2.4	9.005	0.006
33	Total cl IV	18.140	0.272	----------	0.542	0.623
	Cl V:					
34	Ammo (less AF)	1.800	0.027	0.9	0.024	0.028
35	AF ammo[8]	3.500	0.052	0.9	0.047	0.054
36	Cml	0.110	0.002	0.9	0.002	0.002
37	Total cl V	5.410	0.081	----------	0.073	0.084
38	Total	72.732	1.094	----------	1.921	2.209

[1] Estimated, based on arctic test operations.
[2] Conversion factors are based on average cubage for each item. MTON (40 cu ft) of any one item can be found by multiplying its STON weight (2,000 lb) by that item's conversion factor.
[3] Represents 95 percent of total theater daily consumption factor.
[4] Includes weight of product and packing.
[5] Represents 5 percent of total theater daily consumption factor.
[6] Class IV chemical, medical, and signal included in class II.
[7] Classes II(A) and IV(A).
[8] Class V(A).

Table 5-56. Combat Zone and COMMZ

	1	2	3	4
		Lb per man per day		
1	Item	Per Army man in CZ, continental land-mass [1]	Per Army man in CZ, jungle [2]	Per Army man in COMMZ [3]
2	Cl I	7. 690	5. 950	8. 800
	Cl II and IV:			
3	Air	0. 023	0. 016	Negligible
4	Cml	0. 040	0. 090	0. 030
5	Engr	2. 490	8. 950	13. 200
6	Med	0. 112	0. 560	1. 110
7	Ord	4. 950	0. 860	3. 000
8	QM	0. 928	1. 350	0. 750
9	Sig	0. 973	0. 346	0. 630
10	Trans	0. 110	Negligible	6. 000
11	Total cl II and IV	9. 626	12. 272	24. 720
12	Cl III	12. 000	7. 530	41. 000
13	Cl V	13. 400	8. 680	1. 400
14	Total	42. 716	34. 432	75. 920

[1] Based on operations in Europe, all armies, 24 February 1945 to 28 March 1945.
[2] Based on Sixth and Eighth Army operations, December 1943 to September 1944.
[3] Assumed from theater averages, World War II.

Table 5-57. Field Army and Corps in Combat (Continental Landmass)

	1	2	3
		STON per day	
1	Item	Per fld army [1]	Per corps [2]
2	Cl I	1, 508. 0	356. 0
	Cl II and IV:		
3	Air	4. 5	1. 6
4	Cml	7. 8	1. 8
5	Engr	488. 0	115. 0
6	Med	21. 9	5. 2
7	Ord	970. 0	229. 0
8	QM	181. 0	42. 9
9	Sig	191. 0	45. 0
10	Trans	21. 6	5. 0
11	Total cl II and IV	1, 885. 8	445. 5
12	Cl III	2, 350. 0	555. 0
13	Cl V [3]	2, 630. 0	620. 0
14	Total	8, 373. 8	1, 976. 5

[1] Computed for field army of 3 corps, each corps composed of 3 infantry divisions and 1 armored division, and including necessary supporting and service elements (total strength 392,000).
[2] Computed for corps of 3 infantry divisions and 1 armored division, with necessary supporting and service elements (total strength 92,500).
[3] Class V data applicable for periods of 14 days or more.

Table 5-58. Airborne Division in an Airborne Assault [1] [2]

	1	2	3
1	Item	Lb per man per day	STON per div per day
2	Cl I	6. 60	34. 89
	Cl II and IV:		
3	Cml	0. 00	0. 00
4	Engr	1. 00	5. 29
5	Med	0. 42	2. 22
6	Ord	1. 50	7. 93
7	QM	1. 00	5. 29
8	Sig	1. 04	5. 50
9	Trans (avn)	([3])	([3])
10	Total Cl II and IV	4. 96	26. 23
	Cl III and III(A):		
11	Cl III [4]	5. 84	30. 86

Table 5-58. Airborne Division in an Airborne Assault— Continued

	1	2	3
1	Item	Lb per man per day	STON per div per day
12	Cl III(A) [5]	4. 63	24. 50
13	Total Cl III and III(A)	10. 47	55. 36
14	Cl V [6]	86. 06	454. 93
15	Total	108. 09	571. 41

[1] Based on combined strength of assault echelon and followup echelon (total 10,572).
[2] Nongas conditions; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.
[3] Experience factors are not available.
[4] Includes 5,000 gal per day for vehicles in objective area.
[5] Based on average of 4 hours' flying time per organic aircraft per day.
[6] Computed as one-half of basic load.

Table 5-59. Armored Division[a]

1	Item	2	3	4	5	6	7	8	9
		Attack		Pursuit and exploitation		Defense		Reserve	
		Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day
2	Cl I	6.00	43.80	6.00	43.80	6.00	43.80	6.00	43.80
	Cl II and IV:								
3	Cml	0.25	1.80	0.25	1.80	0.25	1.80	0.25	1.80
4	Engr	0.70	5.10	0.54	3.90	0.42	3.10	0.21	1.80
5	Med	0.30	2.20	0.30	2.20	0.15	1.10	0.15	1.10
6	Ord	[b]14.10	103.00	2.14	15.60	2.00	14.60	[c]2.50	1830
7	QM	2.11	15.40	2.11	15.40	2.11	15.40	[c]2.25	16.40
8	Sig	0.87	6.40	0.85	6.20	0.37	2.70	0.37	2.70
9	Trans	0.12	0.88	0.12	0.88	0.12	0.88	0.12	0.88
10	Total Cl II and IV	18.45	134.78	6.31	45.98	5.42	39.58	5.85	42.98
11	Cl III[d]	13.80	101.00	23.30	170.00	7.51	55.00	5.83	43.00
12	Cl V	50.00	365.00	8.80	64.00	53.20	387.00	(e)	----------
13	Total	88.25	644.58	44.41	323.78	72.13	525.38	17.68	129.78

[a] Based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.
[b] Primarily battle losses of combat vehicles.
[c] Increase over inactive situation because of intensified maintenance and replacement activities.
[d] Does not include class III(A).
[e] All elements of division out of combat.

Table 5-60. Infantry Division

a. Infantry Division—Offensive Operations [1]

1	Item	2	3	4	5	6	7	8	9	10	11
		Attack of fortified position		Attack of deliberately organized position		Attack of hastily organized position		Pursuit		Assault of hostile shore	
		Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day
2	Cl I	6.000	46.81	6.000	46.81	6.000	46.81	6.000	46.81	6.900	53.84
	Cl II and IV:										
3	Cml	0.251	1.95	0.252	1.96	0.051	0.39	0.091	0.71	0.191	1.49
4	Engr	2.130	11.12	0.843	6.73	1.260	9.83	0.979	7.63	1,170	9.13
5	Med	0.301	2.85	0.301	2.85	0.125	0.97	0.111	0.86	0.221	1.73
6	Ord	1.670	13.03	1.670	13.03	2.830	22.08	2.080	16.23	0.769	6.00
7	QM	0.942	7.35	0.929	7.25	0.938	7.31	0.659	5.14	0.502	3.41
8	Sig	0.959	7.43	0.991	7.73	0.961	7.49	0.710	5.54	0.389	3.03
9	Trans	0.110	0.95	0.110	0.95	0.110	0.95	0.110	0.95	0.110	0.95
10	Total Cl II and IV	6.363	44.68	5.096	40.50	6.275	49.02	4.740	37.06	3.352	25.74
11	Cl III [2]	4.930	38.46	7.920	61.80	8.470	66.04	15.300	114.39	4.560	35.58
12	Cl V	47.800	372.98	44.400	346.45	42.800	333.96	7.700	60.83	43.300	337.87
13	Total	65.093	502.93	63.416	495.56	63.545	495.83	33.740	259.09	58.112	453.03

[1] Based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.
[2] Does not include class III(A).

Table 5–60. Infantry Division—Continued

b. Infantry Division—Defensive Operations [1]

1	Item	Covering, security force, retirement or delaying action		Defense of position		Inactive situation		Reserve	
		Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day
2	Cl I	6. 000	46. 81	6. 000	46. 81	6. 000	46. 81	6. 000	46. 81
	Cl II and IV:								
3	Cml	0. 361	2. 81	0. 361	2. 81	0. 251	1. 95	0. 251	1. 95
4	Engr	0. 811	6. 32	1. 460	11. 39	0. 501	3. 90	0. 159	1. 24
5	Med	0. 121	0. 94	0. 221	1. 73	0. 151	1. 18	0. 151	1. 18
6	Ord	1. 470	11. 47	1. 500	11. 70	0. 829	6. 46	1. 250	9. 75
7	QM	1. 320	10. 30	1. 100	8. 58	2. 110	16. 46	2. 110	16. 46
8	Sig	0. 721	5. 62	0. 989	7. 71	0. 479	3. 73	0. 479	3. 73
9	Trans	0. 110	0. 95	0. 110	0. 95	0. 110	0. 95	0. 110	0. 95
10	Total Cl II and IV	4. 914	38. 41	5. 741	44. 87	4. 431	34. 63	4. 510	35. 26
11	Cl III [2]	12. 500	97. 87	6. 830	53. 29	6. 410	50. 01	2. 230	17. 40
12	Ca V	26. 100	203. 65	50. 000	390. 15	16. 200	126. 40		
13	Total	49. 514	386. 74	68. 571	535. 12	33. 041	257. 85	12. 740	99. 47

[1] Based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.
[2] Does not include class III(A).

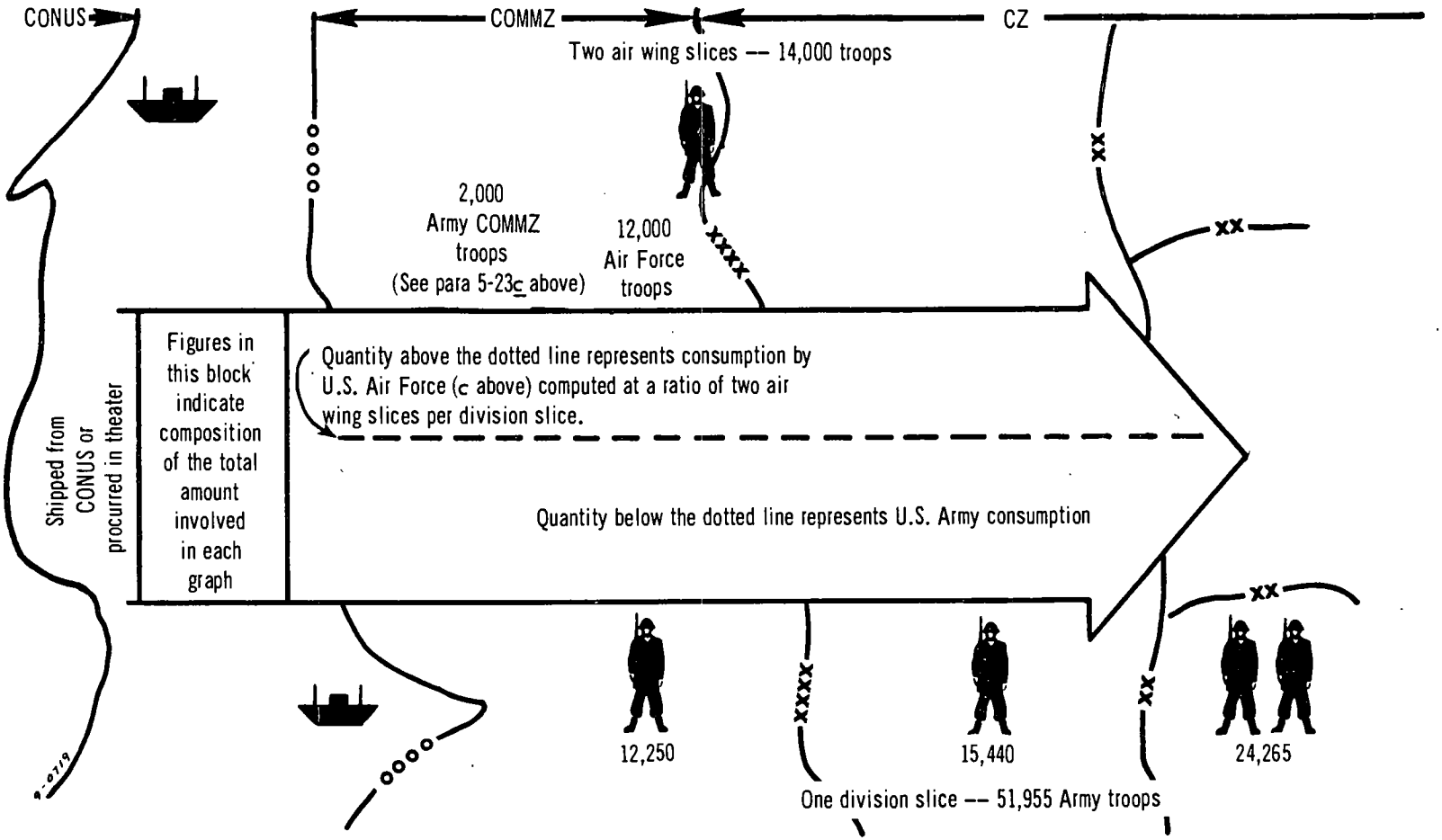
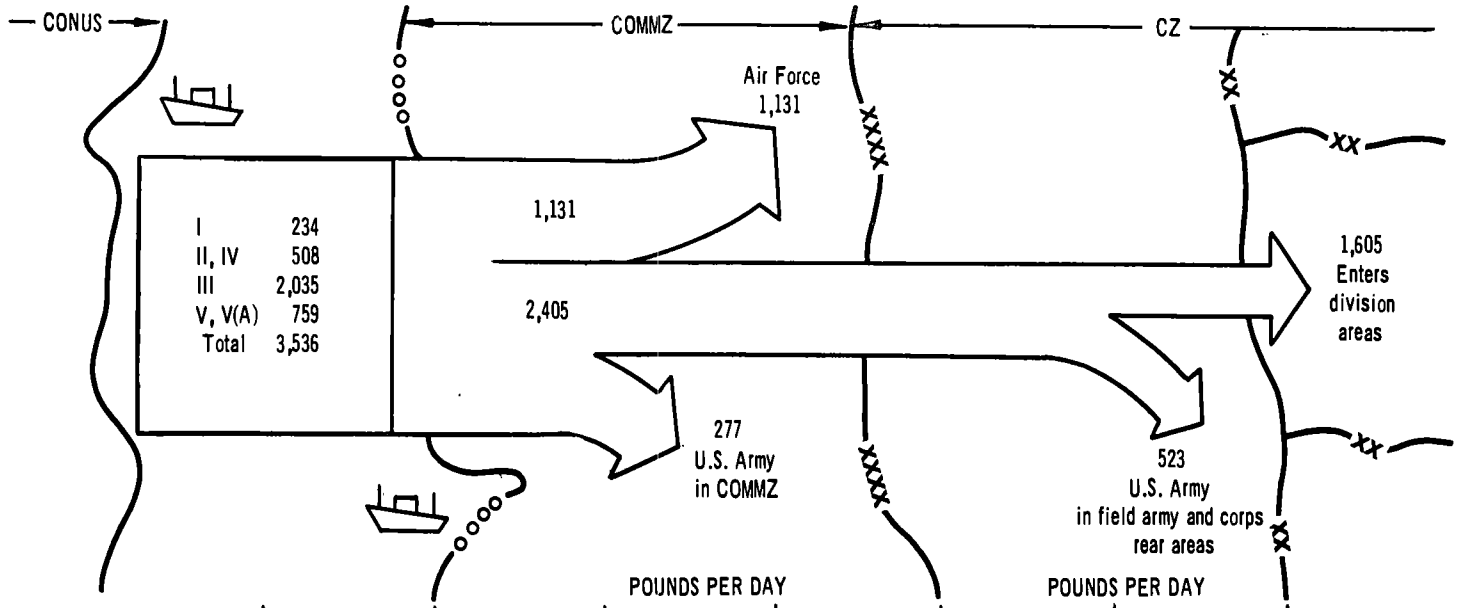


Figure 5–1. General consumption and flow chart.



CLASS	POUNDS PER DAY				POUNDS PER DAY		
	Consumed per men in theater, Army plus Air Force	Consumed by Army in theater, per Army man in theater	Consumed by Air Force in theater, per Air Force man in theater[a]	Consumed by Army in COMMZ, per Army man in COMMZ	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in field army and corps rear areas, per Army man in such arees	Consumed by Army in division areas, per Army man in such areas
I	7.20	7.31	6.70	8.80[b]	6.70	6.70	6.70
II and IV	15.40	17.82	4.54	18.30	17.67	17.55	17.76
III	61.70	47.80	125.00	32.40	53.10	38.20	62.60
V and V(A)	23.00	23.40	25.40	2.40	29.70	5.20	45.30
Total	107.30	96.33	161.64	61.90	107.17	67.65	132.36

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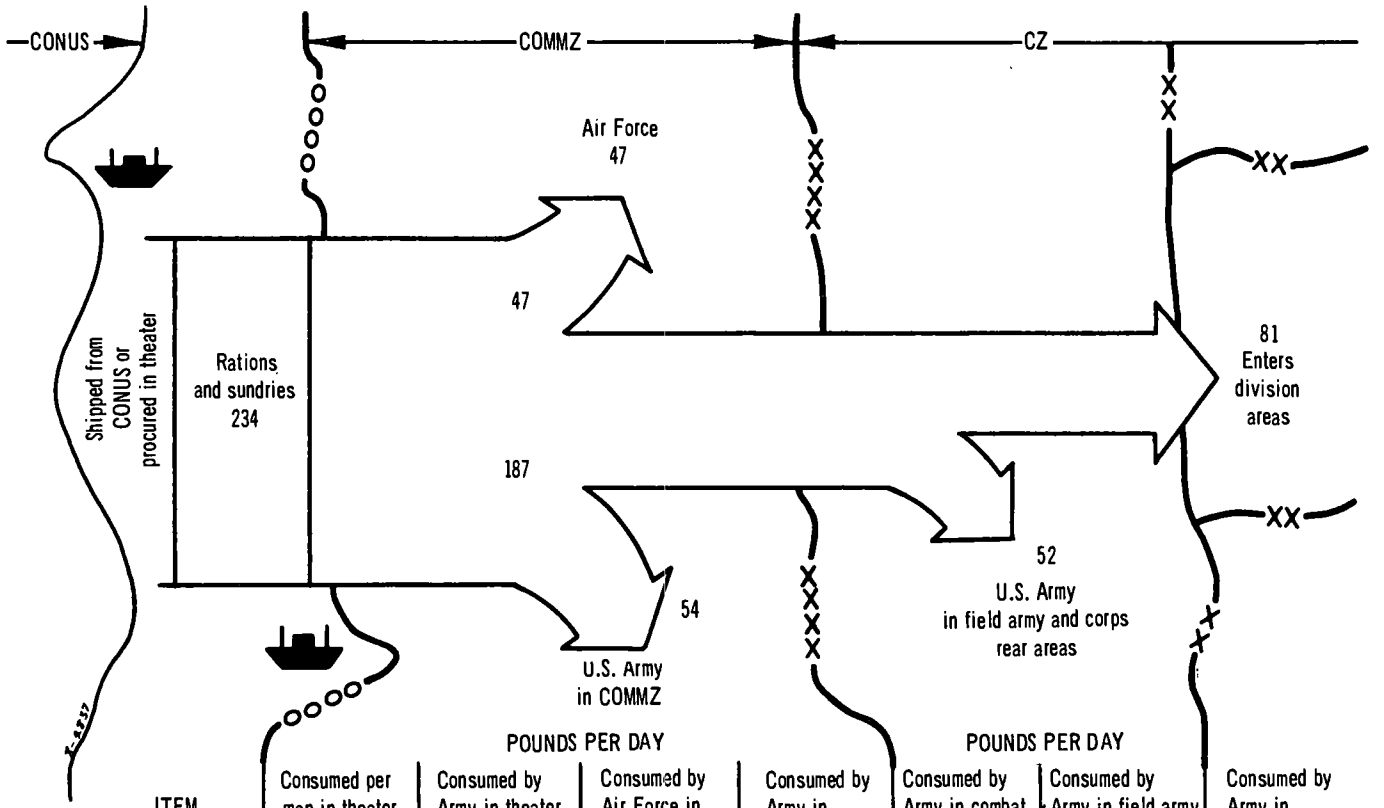
[a]Includes Army troops required in the theater because of the presence of Air Force elements.

[b]This figure is greater than class I figures in other columns because of inclusion of expenditures for civilians, PW's, and allies and miscellaneous theater-wide losses.

Figure 5-2. Resupply factors—STON per division slice per day (all classes).



ITEM	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater, per Army man in theater	Consumed by Air Force in theater, per Air Force man in theater[a]	Consumed by Army in COMMZ, per Army man in COMMZ	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in field army and corps rear areas, per Army man in such areas	Consumed by Army in division areas, per Army man in such areas
Class I	7.2	7.31	6.7	8.8[b]	6.7	6.7	6.7

[a] Includes Army troops required in the theater because of the presence of Air Force elements.

[b] This figure is greater than class I figures in other columns because of inclusion of expenditures for civilians, PW's, and allies and miscellaneous theater-wide losses.

Figure 5–3. Resupply factors—STON per division slice per day (class I).

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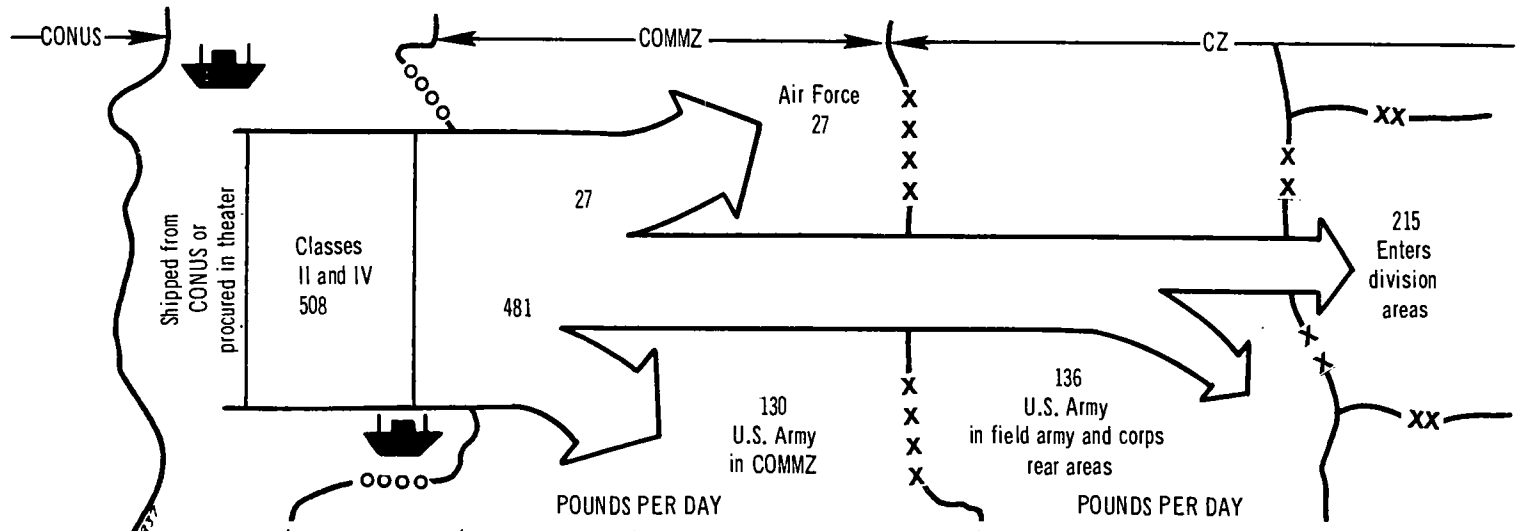
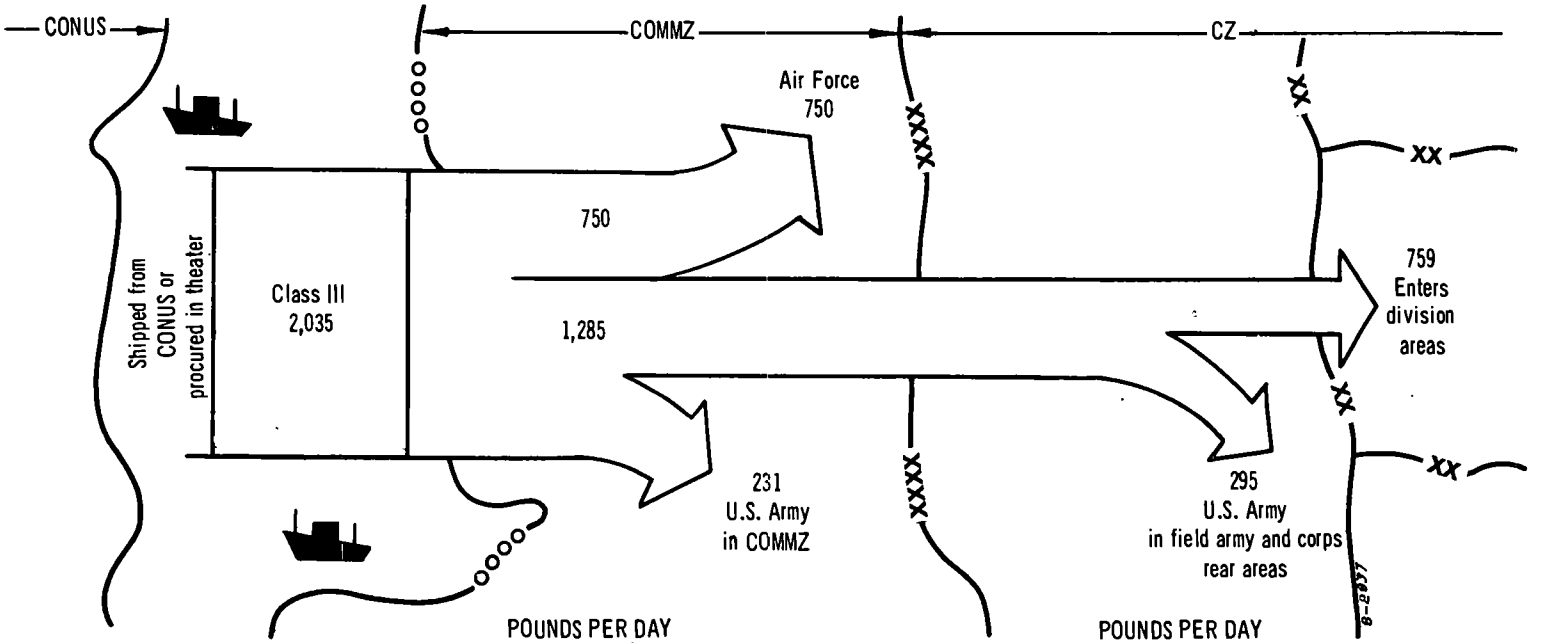


ITEM	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater, per Army man in theater	Consumed by Air Force in theater, per Air Force man in theater[1]	Consumed by Army in COMMZ, per Army man in COMMZ	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in field army and corps rear areas, per Army man in such areas	Consumed by Army in division areas, per Army man in such areas
Classes II and IV	15.40	17.82	4.54	18.30	17.67	17.55	17.76

[1]Includes Army troops required in the theater because of the presence of Air Force elements.

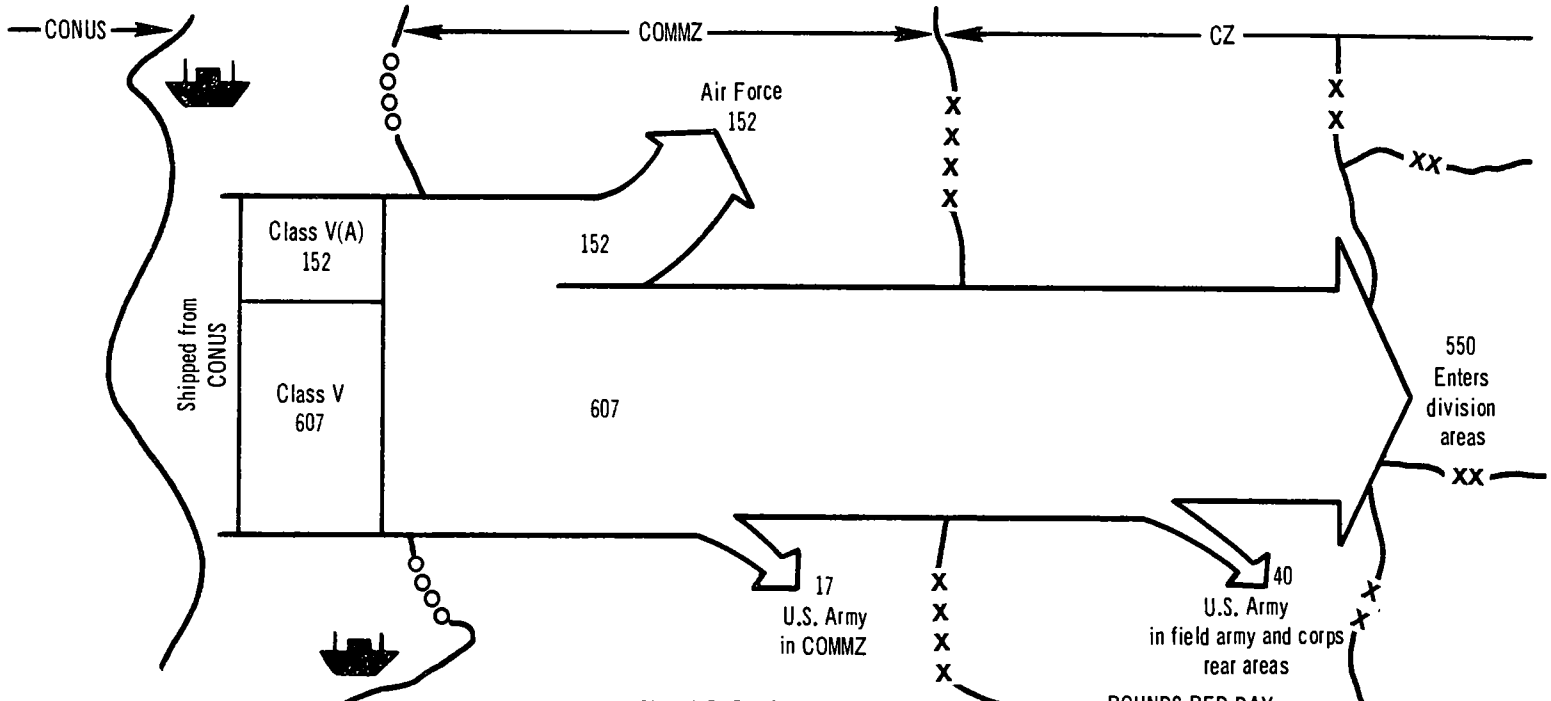
Figure 5–4. Resupply factors—STON per division slice per day (classes II and IV).



ITEM	POUNDS PER DAY: Consumed per man in theater, Army plus Air Force	Consumed by Army in theater, per Army man in theater	Consumed by Air Force in theater, per Air Force man in theater[1]	Consumed by Army in COMMZ, per Army man in COMMZ	POUNDS PER DAY: Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in field army and corps rear areas, per Army man in such areas	Consumed by Army in division areas, per Army man in such areas
Class III	61.7	47.8	125.0	32.4	53.1	38.2	62.6

[1] Includes Army troops required in the theater because of the presence of Air Force elements.

Figure 5–5. Resupply factors—STON per division slice per day (class III).



ITEM	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater, per Army man in theater	Consumed by Air Force in theater, per Air Force man in theater	Consumed by Army in COMMZ, per Army man in COMMZ	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in field army and corps rear areas, per Army man in such areas	Consumed by Army in division areas, per Army man in such areas
Class V	4.60	23.4	-------	2.4	29.7	5.2	45.3
Class V(A)	18.40	-------	25.4	-------	-------	-------	-------

Figure 5-6. Resupply factors—STON per division slice per day (classes V and V(A)).

Setcion VIII. PROCUREMENT

5-25. Procurement

a. Procurement Operations. Since World War II the U.S. Army has provided logistic support for allied forces throughout the world besides fulfiling its own requirements. "Offshore" procurement agencies established in Europe, the Middle East, and the Far East supplement supplies that must come from the CONUS. Officers assigned to military assistance advisory groups (MAAG) may estimate the personnel required in a procurement section for the supplementary support of allied forces by using figure 5-7.

b. Procurement Leadtime. Procurement leadtime may vary from 2 to 24 months. The variables involved preclude obtaining an average estimate of leadtime with any degree of accuracy. Some factors affecting leadtime are type of item, quantity to be procured, status of production base, and tooling involved. The appropriate U.S. Army Materiel Command commodity command should be consulted on an item-by-item basis when a close estimate of leadtime is required.

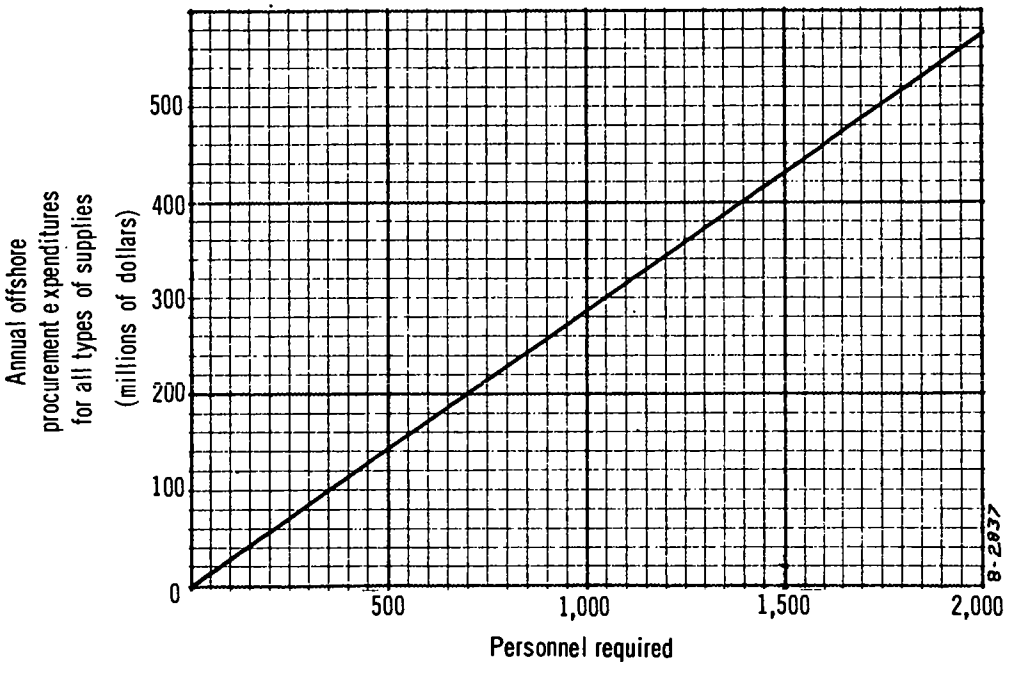


Figure 5-7. Personnel requirements for procurement sections.

Section IX. STORAGE

5-26. Definition of Terms

An understanding of the following terms is necessary to use the data in this section in determining storage area requirements. (See AR 320-5 and the TM 743-200-series.)

a. Storage space—Any space, without regard to type of construction or improvement, used for storage.

b. Storage building—Any building constructed or acquired for the storage of supplies, even though some part of it has been diverted to and is used for offices, depot utility storage, or repair shops. Buildings constructed or acquired for office buildings, repair shops, depot utility storage buildings, except when they are used in whole or in part for the storage of supplies, are not considered storage buildings. The actual area used for storage purposes within such a building is considered storage space for reporting purposes.

(1) *Warehouse space*—Area in a building designed for storage purposes and constructed with roof and complete side and end walls.

(2) *Heated space*—Area in which the temperature may be controlled within specified limits by the application of heat.

(3) *Unheated space*—Area not equipped with heating facilities.

(4) *Humidity-controlled space*—Warehouse area equipped with humidity-control equipment.

(5) *Flammable space*—Warehouse area designed for the storage of highly flammable material.

(6) *Shed space*—Space in a covered structure having one or more sides or ends open or both. Does not include covered X-sites, Y-sites, or transitory-type shelters.

(7) *Other space*—Space being used for storage in any structure designed for other than storage purposes (e.g., barracks, dry tanks, hangars, transitory shelters, and Quonset buildings). Covered X-sites and Y-sites, hutments, and temporary canvas shelters are included when used for storage.

c. Gross space—Inside area between exterior walls without deductions for firewalls and other structural losses. Overall measurements of open storage area with no deductions for trackage and permanent roads in the area.

d. Bin storage—Storage of unpackaged parts, subassemblies, assemblies, or end items in bins so that an item may be withdrawn without breaking open a package containing a number of such items.

e. Aisle in storage space—Any passage within a storage area.

f. Receiving and shipping space—Gross space designated as work area for receipt and shipment of supplies and equipment.

g. Nonstorage space—That area within gross space that is not used for storage because of structural losses or designation for other than storage purposes. Includes transit shed space when used or reserved for that purpose.

h. Net storage space—The floor area on which bins are erected plus the floor area on which material can be stored.

i. Open storage space—Ground area designated for storage.

j. Open improved storage space—Open area that has been graded and hard surfaced or prepared with topping of some suitable material to permit effective materials-handling operations.

k. Open unimproved storage space—Open area that has not been surfaced for storage purposes.

l. Open unimproved wet space—That water area specifically allotted to and usable for the storage of floating equipment.

m. Magazine area—The area in a covered structure, above or below ground, constructed for the storage of ammunition and explosives.

n. Tank storage space—Space in tanks designated for the storage of supplies other than petroleum products.

o. Ammunition and toxic materiel open space—Area especially prepared for storage of explosive ammunition and toxic materiel. For reporting purposes it does not include the surrounding area restricted for storage because of safety distance factors. It includes barricades and improvised coverings.

p. Cold storage warehouse—Space in which a controlled temperature below 50° F. may be maintained.

(1) *Chill space*—Refrigerated warehouse space in which the temperature can be controlled between 32° F. and 50° F.

(2) *Freeze space*—Refrigerated warehouse area in which the temperature can be controlled below a level of 32° F.

q. Allocated space—That area designated by higher authority representing the gross area formally apportioned for use.

r. Dispersed storage area—That portion of a depot or subinstallation that is geographically located away from the main establishment, but not at another reporting installation.

s. Site area—

(1) In covered storage the total land area required for buildings, spaced at minimum distances, plus all the necessary operating areas, such as access roads, depot roads, railway sidings, and truck parks.

(2) In open storage the total land surface required for net usable general storage area as defined above plus that additional area required to fulfill safety regulations and to operate properly the storage facility as a whole.

t. Vertical space occupancy effectiveness—A factor obtained by dividing actual by potential storage height for a specific supply category.

5-27. Storage Factors

a. Table 5-61 gives optimum storage tonnage area requirements for support of military operations. These data are for general planning pur-

Table 5–61. Theater Tonnage and Space Requirements

1	Class	2 Consumed per man in theater (Army plus AF) (STON per man per mo)	3 Percentage of STON of supplies stored		5 STON per man per month of supplies stored		7 Square feet per STON		9 Required space per man per month of supply (sq ft)	
			Covered	Open	Covered	Open	Covered	Open	Covered	Open
2	I	0. 1065	60	40	0. 0639	0. 0426	15	20	0. 958	0. 852
3	II and IV	0. 2316	50	50	0. 1158	0. 1158	10	16	1. 158	1. 850
4	III	0. 9195	(Tk farm)							
5	V	0. 4074	10	90	0. 0407	0. 3667	15	20	0. 611	7. 334
6	V(A)	0. 0549	(Air dep)							

poses only and may vary substantially as a result of climatic conditions or the tactical situation. For detailed data on storage planning, see the TM 743–200-series.

b. For classified data pertaining to storage of hazardous materials, see FM 101–10–3, chapter 5.

5–28. Average Stack Heights

Figures in *a* and *b* below are for use in theaters. For CONUS storage, increase by 25 percent.

a. Covered Storage. All Services 8 feet.

b. Open Storage. All Services 6 feet.

5–29. Gross Space and Site Area Factors

The factors in table 5–62 provide requirements for gross space (as defined in para 5–26*c*) and site area square footage, i.e., by multiplying requirements in table 5–61, columns 9 and 10, by each factor in turn.

Table 5–62. Gross Space and Site Area Factors

1	Class of supply	2 Gross space factors [a]		4 Site area factors [b]	
		Covered	Open	Covered	Open
2	I	1. 40	1. 50	2. 00	1. 50
3	II and IV	1. 66	1. 75	2. 27	2. 00
4	III [c]	1. 25	1. 30	1. 80	1. 43
5	V	1. 25	1. 25	[d] 112. 00	([e])

[a] Apply additional factor of 3 for storage in the combat zone.
[b] Apply additional factor of 5 for storage of classes I, II, III, and IV in the combat zone.
[c] Excludes bulk storage of petroleum in tanks.
[d] These factors consider the dispersion necessary as a safety precaution in storing ammunition.
[e] See paragraph 5–28.

5–30. Operating Personnel Required for All Storage in a Theater

Figure 5–8 may be used to determine personnel requirements for all storage operations in a theater. Prisoners of war and civilians may be included as available.

5–31. Miscellaneous Factors [1]

Ammunition storage per kilometer of road.[2]	621 STON
Ammunition storage per square kilometer.[2]	1,931 STON
Minimum hardstand requirements for 2,500 vehicles.[3]	110,000 sq ft
Solid footing for vehicle park for 2,500 vehicles.	4,000,000 sq ft
Minimum hardstand requirement for artillery and combat vehicles, per item.	350 sq ft

[1] Reference: TM 9–1300–206 (overseas only).
[2] Refers to temporary storage of ammunition along roadways and in urban fields and forest, such as may be found in combat zones.
[3] Data based on the assumption that hardstand area will not be required for the total number of vehicles at any one time.

5–32. Handling of Supplies

a. Labor Requirements.

(1) *Hand operations.* For long-term planning, labor requirements for handling supplies by hand are computed on the average of ½ ton per man per hour for 10 hours each day. For short periods the average is much higher.

(2) *Mechanical handling.* For planning, the labor requirements for handling supplies by mechanical equipment, such as forklift trucks and tractor-trailer trains, are normally limited to a working foreman and equipment operators to op-

erate the mechanical equipment necessary to handle these supplies efficiently.

b. Handling Crews.

(1) *Hand operations.* The number of men who may be employed advantageously in loading or unloading one freight car is nine (one working foreman and eight laborers). The maximum crew for loading or unloading average loads by hand on Army trucks is five (one working foreman and four laborers).

(2) *Mechanical handling of palletized loads.* The number of men who may be advantageously employed in loading or unloading one freight car or truck of palletized supplies using mechanical-handling equipment is three (one working foreman and two materials-handling equipment operators).

c. Time Estimate (Based on Manual Handling). The time estimate for average packaged or bundled military loads at depots, supply points, or using units, under average conditions, with a five-man crew for each truck or trailer and the number of trucks or trailers to be loaded or unloaded simultaneously dependent on amount of labor available, is as follows:

Loading and unloading	*2½-ton truck*	*2½-ton trailer*
Average time	50 min	20 min
Minimum time	30 min	12 min

5–33. Materials-Handling Equipment Requirements

A depot supplying 100,000 men will require about 7,700 MTON of materials-handling equipment, including conveyors, pallets, scales, tractors, trailers, forklift trucks, handtrucks, lumber-straddle trucks, and stock-picker trucks (fig. 5–9).

5–34. Illustrative Problems

a. Situation, Problem A. To determine storage requirements for a theater of operations requiring 100,000 MTON of class I supplies.

b. Solution, Problem A. Storage area requirements:

A MTON = 40 cu ft.

Therefore, 100,000 MTON × 40 = 4,000,000 cu ft of supplies to be stored.

Minimum percentage of covered storage required is 60 percent (table 5–61).

Therefore, 40-percent open storage required.

0.60 × 4,000,000 cu ft = 2,400,000 cu ft of supplies requiring covered storage.

0.40 × 4,000,000 cu ft = 1,600,000 cu ft of supplies to be stored in the open.

Average stack heights (para 5–28):

Covered storage = 8 feet.

Open storage = 6 feet.

2,400,000 cu ft ÷ 8 ft = 300,000-sq ft net usable area of covered storage required.

1,600,000 cu ft ÷ 6 ft = 267,000-sq ft net usable area of open storage required.

Gross space for each type of storage is based on net usable general storage areas. Factors for computations, as found in table 5–62, are—

Covered storage = 1.4

Open storage = 1.5

(Assume storage is to be in the COMMZ; hence, additional combat zone factor of 3 is not required.)

300,000 sq ft × 1.4 = 420,000-sq ft gross space required for covered storage.

267,000 sq ft × 1.5 = 400,500-sq ft gross space required for open storage.

Site areas for each type of storage are based on gross. Table 5–62 contains factors for computations.

Covered storage = 2.0.

Open storage = 1.5.

(Assume storage is to be in the COMMZ; hence, additional combat zone factor of 5 is not required.)

420,000 sq ft × 2.0 = 840,000-sq ft site area required for covered storage.

400,500 sq ft × 1.5 = 600,750-sq ft site area required for open storage.

Total site area required:

Covered storage = 840,000 sq ft
Open storage = 600,750 sq ft
1,440,750 sq ft

1,440,750 sq ft ÷ 43,560 sq ft (1 acre) = 30.7 or 31 acres of site area required.

c. Situation, Problem B. To determine operating personnel and materials-handling equipment requirements for all storage in a theater that has a strength of 250,000 men.

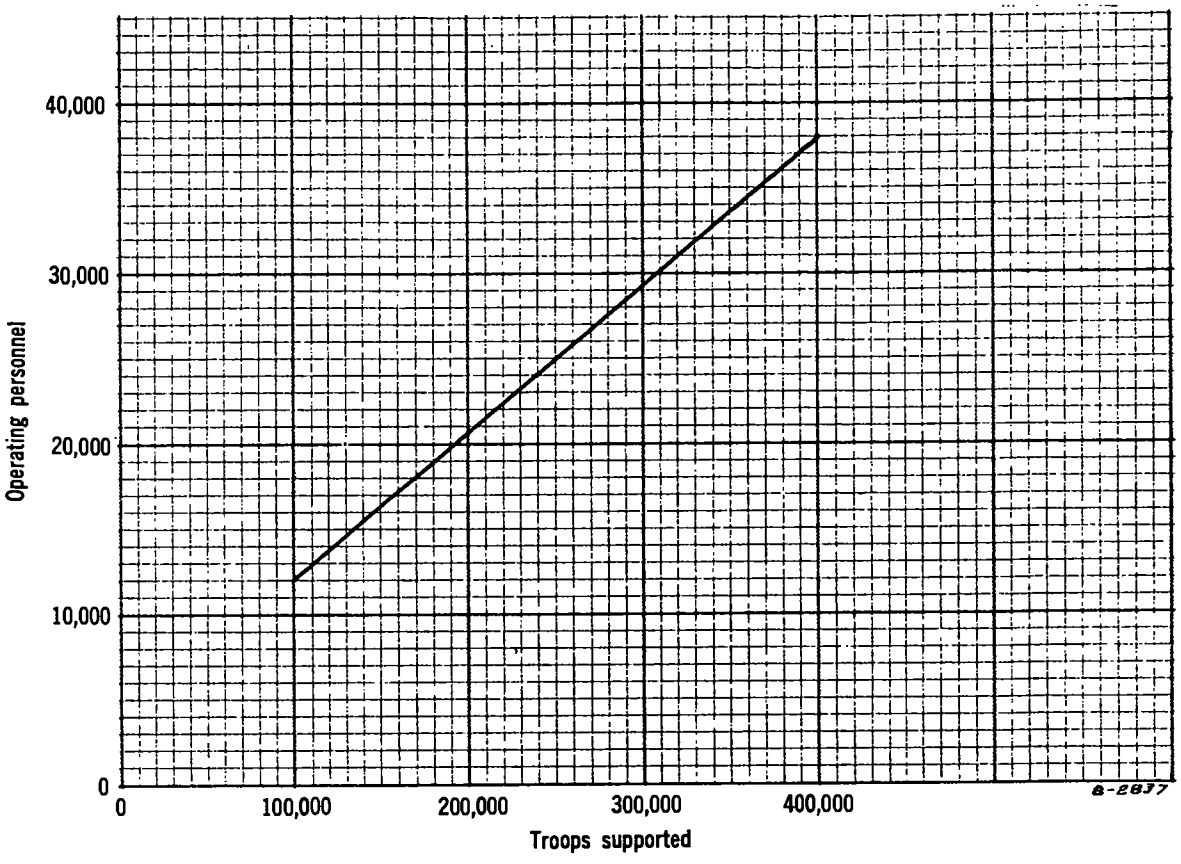


Figure 5–8. Requirements for storage personnel.

d. Solution, Problem B.

(1) *Part I, operating personnel requirements.* On the horizontal scale of figure 5–8 locate the vertical line representing 250,000 men. This line crosses the oblique graph line at the horizontal line representing 24,500 *operating* personnel, as indicated on the left margin. Therefore, for general planning purposes 24,500 men are needed to operate theater depots.

(2) *Part II, materials handling equipment requirements.* Using the same theater strength of 250,000 men, figure 5–9 shows that 18,500 MTON of materials-handling equipment will be required.

5–35. Characteristics of Materials-Handling Equipment

Table 5–63 lists materials-handling equipment and certain characteristics, to include load and lift capacities. (See also table 5–4.)

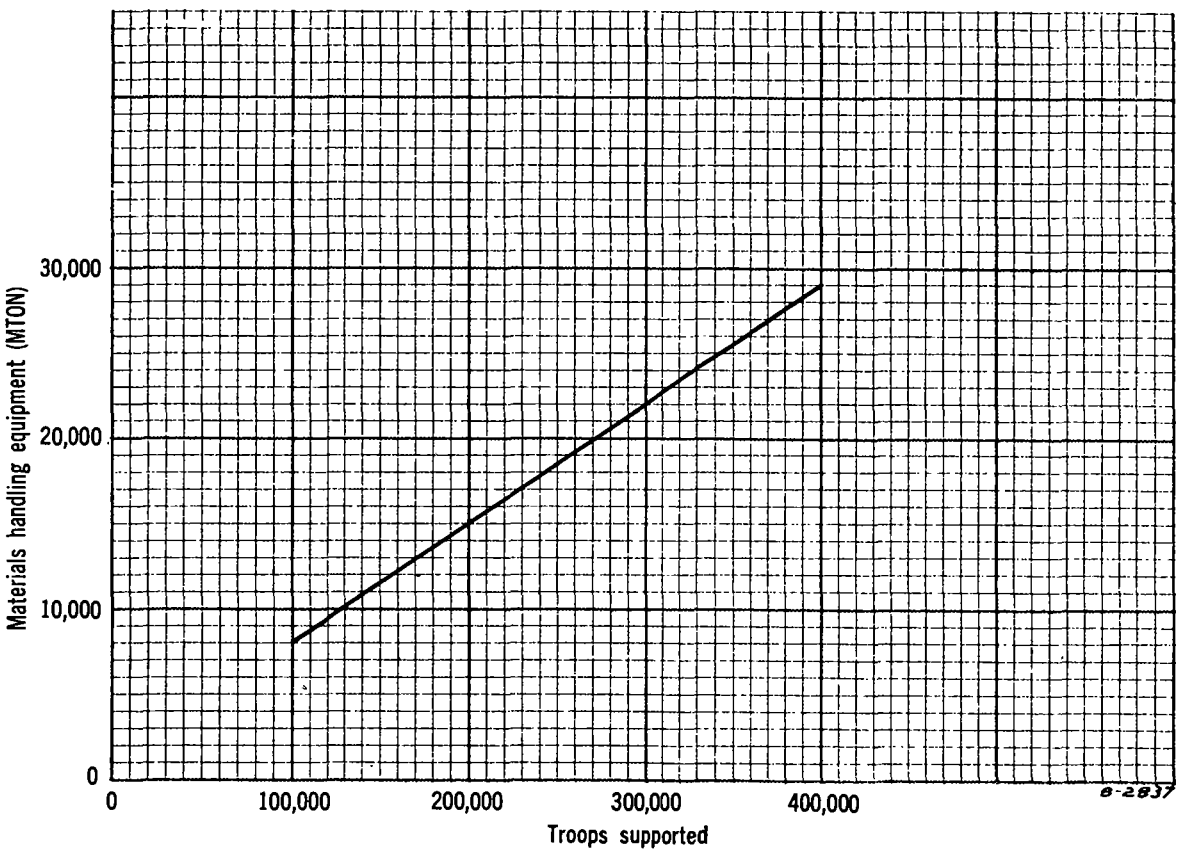


Figure 5–9. Requirements for materials-handling equipment.

Table 5–63. Characteristics of Materials-Handling Equipment

1	2	3	4	5	6	7	8	9	10	11	12
Item and line item number	Dimensions			Weight (STON)		Displacement (cu ft)	Capacity		Types of tires (S—solid rubber) (P—pneumatic)	Method of operation	Primary use
	Length (ft)	Width (ft)	Height (ft) (min)	Operating	Shipping		Load (lb)	Height of lift			
Trk, lift, fork:											Useful in moving and stacking palletized loads.
2 X49188	5. 79	2. 67	7. 04	2. 00	--------	109	2, 000	8 ft 4 in	S	Elec	
3 X50284							4, 000	10 ft 7 in	S	Elec	
4 X50421	6. 79	3. 50	7. 58	--------	3. 85	180	4, 000	12 ft 0 in	S	Elec	
5 X50969	8. 42	3. 50	9. 67	--------	4. 47	285	6, 000	14 ft 0 in	S	Elec	
6 X51106	5. 75	3. 67	7. 00	2. 24	--------	148	2, 000	10 ft 7 in	--------	Gas	
7 X51243							2, 000	9 ft 4 in	S	Gas	
8 X51380	10. 08	6. 52	8. 46	--------	3. 25	556	4, 000	12 ft 0 in	P	Gas	
9 X51654	7. 17	3. 83	7. 17	--------	3. 90	197	4, 000	15 ft 0 in	S	Gas	
10 X51791	9. 71	5. 63	9. 50	--------	5. 40	51	6, 000	14 ft 0 in	P	Gas	
11 X52202	10. 33	3. 50	8. 67	--------	4. 00	313	6, 000	10 ft 7 in	S	Gas	
12 X52339	8. 75	4. 17	10. 00	--------	5. 35	365	6, 000	14 ft 0 in	S	Gas	
13 X52613	11. 92	4. 42	5. 65	--------	6. 60	305	10, 000	8 ft 4 in	S	Gas	
14 X52750	12. 33	7. 17	12. 50	--------	8. 20	1, 105	15, 000	17 ft 6 in	P	Gas	
Trk, lift, fork, rough terrain:											Transfer of cargo on unimproved surfaces; most common usage, beach operations.
15 X51928	15. 13	7. 17	7. 50	--------	13. 50	812	6, 000	12 ft 0 in	P	Gas	
16 X52476	16. 94	8. 58	8. 33	--------	15. 00	1, 350	10, 000	12 ft 0 in	P	Gas	
Trk, platform, util, ½-ton, 4 x 4, with equip:											Primarily for transporting unit loads short distances. May be used for stacking. Less expensive than fork-lift trucks, but less maneuverable.

Table 5-63. Characteristics of Materials-Handling Equipment—Continued

1	1	2	3	4	5	6	7	8	9	10	11	12
	Item and line item number	Dimensions			Weight (STON)		Displacement (cu ft)	Capacity		Types of tires (S—solid rubber) (P—pneumatic)	Method of operation	Primary use
		Length (ft)	Width (ft)	Height (ft) (min)	Operating	Shipping		Load (lb)	Height of lift			
17	X55627	9.83	4.16	4.08			86	10,000	0 ft 4 in		Elec	
	Trac, wheeled, whs:							Drawbar pull (lb)				Used for towing one or more trailers. The tractor is small and maneuverable and should be used for moving when distance exceeds 250 feet.
18	W89009	6.17	3.46	5.67		1.35	121	2,000		S	Elec	
19	W89283	7.17	3.54	5.13		1.77	130	4,000		S	Elec	
20	W89557	9.83	5.67	5.58		2.50	311	4,000		P	Gas	
21	W89594	9.92	5.83	4.75		4.98	275	7,500		P	Gas	
	Cran, trk, whs:							Load (lb)				Handles loads of shapes and sizes that are difficult to move with other equipment.
22	F38967	11.60	5.38	6.04		6.00	377	6,000		S	Elec	
23	F39104	13.08	8.00	6.42		10.35	672	10,000		P	Gas	
	Trk, straddle-carry:											Used extensively for moving lumber, poles, pipe, rods, and girders.
24	X56997	16.00	8.00	13.54		8.25	1733	30,000		P	Gas	

Section X. DISTRIBUTION

5-36. Normal Order and Shipping Times

Table 5-64 illustrates the time to process normal bulk shipment of supplies. Times shown are for illustrative purposes only and represent an average of the probable maximum time intervals for processing a wide variety of items under varying conditions. Such intervals will increase or decrease depending on such factors as the length and complexity of the requisition, the class of supply, the distance of the theater from the CONUS, the availability of transportation, the type of transportation and handling facilities employed, and the workload on the various installations.

5-37. Army Repair Parts Supply System

The Army supply system is based on selective stockage, single-line-item requisitions, and electronic transmission and processing of supply data. Requisitions are processed through the field army support command and the theater army support command to CONUS supply sources by means of high-speed data transmission equipment (transceivers). When coupled with centralized stock control, high-speed data processing equipment, and direct delivery of theater nonstocked items to forward supply points, the system offers substantial reduction in order and shipping times.

5-38. Buildup of Supply Levels

a. For estimation of requirements when it is desired to buildup a certain level of supplies by a given date, at the same time adequately supplying present and future contemplated operations during the buildup period, the following formula is useful:

$$S = C\left(1 + \frac{L}{T} + W\right), \text{ when—}$$

S = shipping requirements during the buildup phase, expressed in pounds per day.
C = consumption (average) in pounds per day.
L = the supply level to be attained, expressed in days of supply.
T = time length of buildup phase in days.
(Given any four of the factors, the fifth can be determined by transposing.)
W = wastage factor (percentage of total consumption expressed as a decimal). This factor is based on experience in the particular theater and normally ranges from 0 to 0.25.

b. Since the formula in *a* above assumes a constant troop strength, a chart similar to figure 5-10 may be used to show the relationship between changes in troop strength, the cumulative consumption, and the cumulative receipts in the establishment of a specified level of supply during a given buildup period.

5-39. Lines of Communications Buildup Capacity

a. General.

(1) The chart in figure 5-11 indicates the maximum cumulative strength that can be built up in the shortest time, using lines of communications of fixed capacity, if these lines of communications also carry replenishment loads for personnel previously transmitted.

(2) The chart is applicable to situations in which maintenance loads are directly proportional to loads previously carried (initial loads) and has been prepared for the values 2, 4, 6, and 10 of R (ratio of initial to maintenance loads). Additional lines can be added readily to the chart for additional values of R.

(3) For each value of R two lines are shown on the chart—one solid and one dashed. For each value of R use of the solid or dashed line in computations depends on the assumption applicable to the situation.

(*a*) The solid-line curve in each case is based on the assumption that at any time T, the strength being served on a maintenance basis, is equal to the accumulation of strength previously served on an initial basis (i.e., maintenance begins immediately upon arrival in the theater, and initial loads are not alternately depleted and replenished).

(*b*) The dashed-line curve in each case is based on the assumption that the increment of strength served on an initial basis in any 1 month will be served on a maintenance basis during the following month (i.e., initial loads would be depleted, on the average, by about 15 days' maintenance supply before replenishment would begin).

Table 5–64. Maximum Oversea Order and Shipping Time Allowance for Troop Support Requisitions

1		2	3	4	5	6	7	8	9	10	11	12	13	14
1	Area [a] Issue group Priority designators Emphasis required Cycle segments	A	B 1 1 through 3 7-day workweek, 24-hour workday—issue stocks to "0" balance Consecutive hours	C	A	B 2 4 through 8 7-day workweek, 24-hour workday—issue stocks to "0" balance Calendar days	C	A	B 3 9 through 15 Regular workweek, regular-shift workday—issue to control level Calendar days	C	A	B 4 [b] 16 through 20 Regular workweek, regular-shift workday—issue to control level Calendar days	C	Responsible agency
2	From transmittal of requisitions by oversea command to receipt by initial source of supply.	0	0	0	0	0	0	1	1	1	1	1	1	Oversea command.
3	From receipt of requisition by initial source of supply until supplies are released to carrier.	24	24	24	3	3	3	10	10	10	12	12	12	Initial source and shipping activities.
	Note. This time is divided as follows:													
4	Stock control activity	(8)	(8)	(8)	(1)	(1)	(1)	(3)	(3)	(3)	(4)	(4)	(4)	Initial source.
5	Shipping activity	(16)	(16)	(16)	(2)	(2)	(2)	(7)	(7)	(7)	(8)	(8)	(8)	Shipping activity.
6	From date supplies are turned over to carrier until receipt at oversea terminal.	88	88	88	8	8	8	28	28	28	37	37	52	Transportation agency.
	Note. This time is divided as follows:													
7	Time depot to terminal	(24)	(24)	(24)	(2)	(2)	(2)	(5)	(5)	(5)	(9)	(9)	(9)	
8	Time in terminal	(12)	(12)	(12)	(2)	(2)	(2)	(5)	(5)	(5)	(10)	(10)	(10)	
9	Time in transit (air or sea)	(52)	(52)	(52)	(4)	(4)	(4)	(18)	(18)	(18)	(18)	(18)	(33)	
10	From receipt at oversea terminal to recorded receipt by requisitioner.	56	56	56	4	4	4	11	6	6	15	10	10	Oversea command.
	Note. This time is divided as follows:													
11	Time in discharge	(24)	(24)	(24)	(2)	(2)	(2)	(3)	(3)	(3)	(7)	(7)	(7)	
12	Terminal intratheater movement and recording in requisitioner's records.	(32)	(32)	(32)	(2)	(2)	(2)	(8)	(3)	(3)	(8)	(3)	(3)	
13	Total	168	168	168	15	15	15	50	45	45	65	60	75	

[a] Area A—Europe; area B—Alaska, Bermuda, Caribbean, Hawaii, and South America; area C—all other oversea areas.

[b] See AR 725–50, paragraph 2–13*d*, for instructions on the assignment of required delivery date beyond the normal order and shipping time for issue group 4.

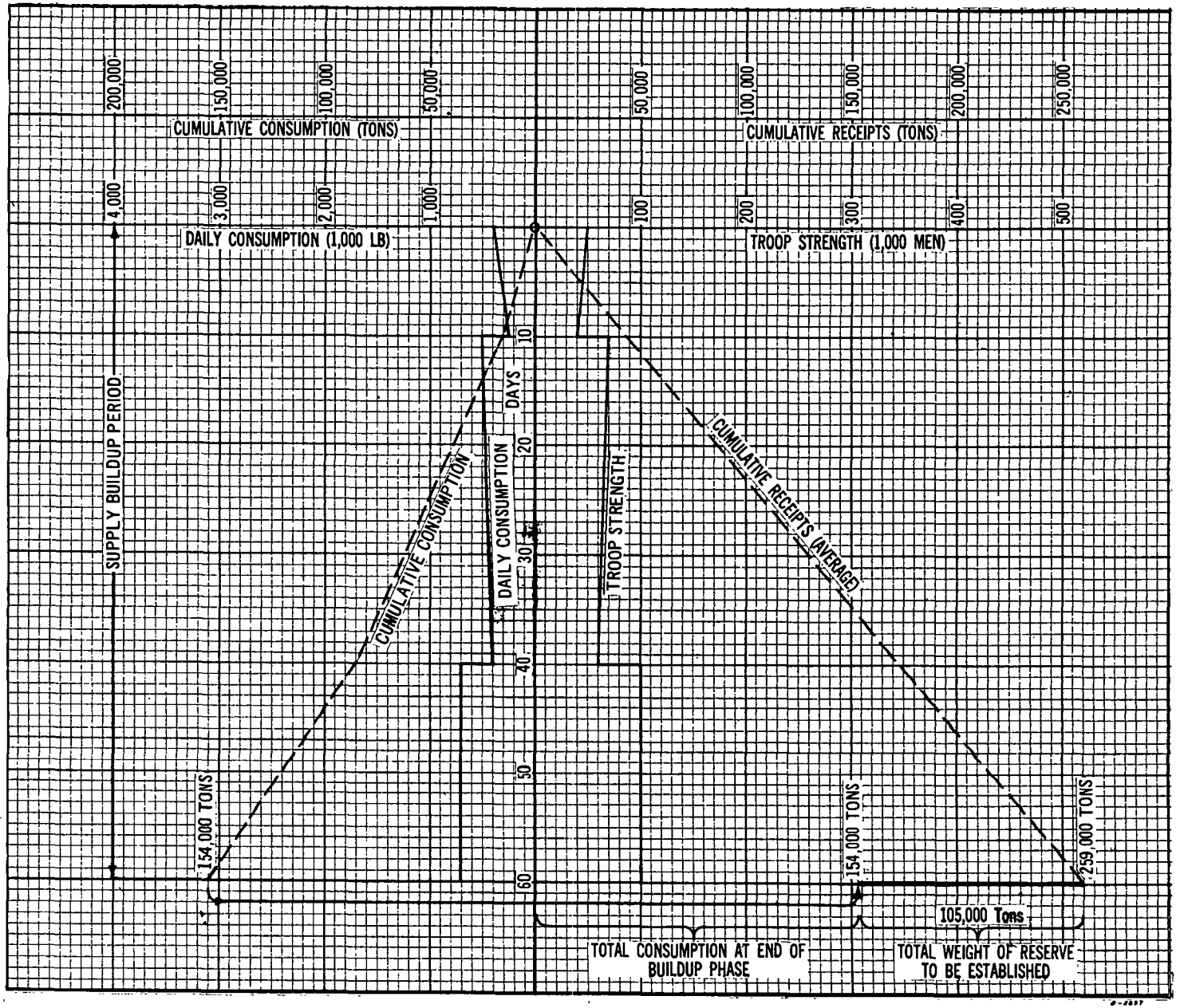


Figure 5–10. Supply level relationships.

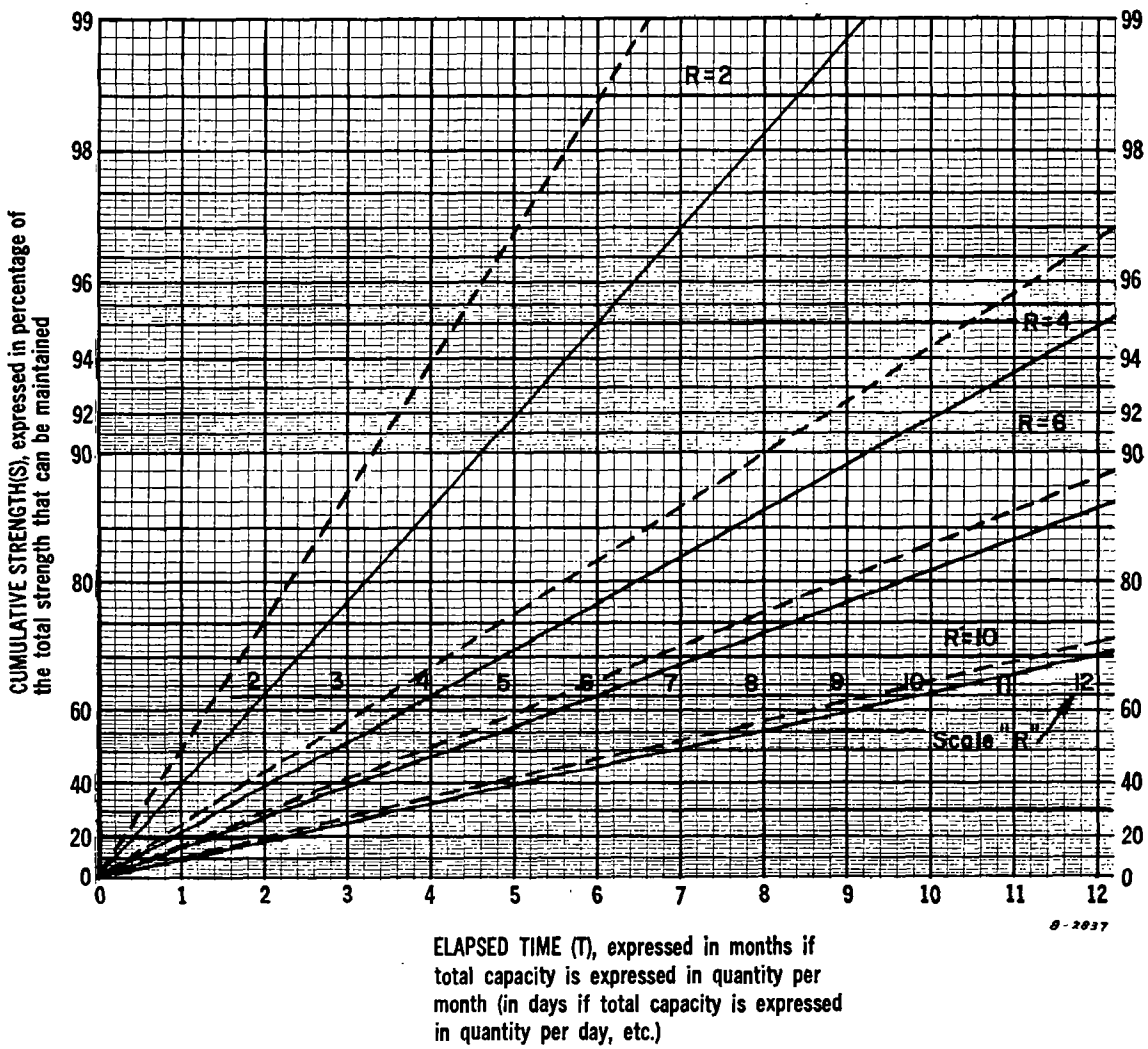


Figure 5–11. Lines of communications capacity.

b. Construction of Curves for Additional Values of R. To construct curves for values of R other than those shown, proceed as follows:

(1) For solid lines (see assumption in *a*(3) above) draw a straight line through the origin (0, 0) and the point on scale R representing the value of R (ratio of initial to maintenance loads).

(2) For dashed lines (see assumption in *a*(3) above) draw a straight line through the origin (0, 0) and the point on scale R that is less by 0.5 than the value of R.

c. Examples of Use of Chart. The chart (fig. 5–11) may be used in calculations relating to a movement of troops or supplies through a terminal or, analogously, to their movement over any available lines of communications, e.g., a railroad, a highway, an air transport route. It can be used to determine the time it would take to reach various strengths, the strength that can be accumulated in any amount of time, and the necessary shiploads of initial or maintenance supplies. The ratio R may be based on space requirements; number of cars, ships, tonnages; number of individuals; etc.

(1) *Example 1.*

(*a*) *Problem.* The capacity of a port=300,000 MTON per month. Initial equipment for troops moving through the port=4.8 MTON per man; supplies for maintenance of troops moved through the port=0.8 MTON per man per month. What strength can be built up through this port in 7 months if maintenance supply for the troops begins immediately with their arrival in the theater?

(*b*) *Solution.*

1. R=initial÷maintenance load=4.8÷0.8=6.

2. T=time elapsed=7 months.

3. From the chart locate T=7 on the horizontal scale; continuing vertically upward to the intersection of T=7 with the *solid* line for R=6, read "Cumulative Strength (S)" from the vertical scale=69 percent of the total strength that can be maintained.

4. Total strength that can be maintained=300,000÷0.8=375,000 troops.

5. Therefore, cumulative strength after 7 months=69 percent of 375,000=259,000 troops.

(2) *Example 2.*

(*a*) *Problem.* Assuming the same circumstances as in (1) (*a*) above, how many new troops will be moved through the port during the 7th month?

(*b*) *Solution.*

1. Proceed as in (1) (*b*) above, except determine the cumulative strength after 6 months=64 percent of the total strength that can be maintained.

2. From the solution in (1) (*b*) above and the foregoing, the observation is that from the end of the 6th to the end of the 7th month (i.e., during the 7th month) the cumulative strength changed from 64 percent to 69 percent of the total strength that could be maintained.

3. Therefore, the new troops moved in during the 7th month represent 69 percent less 64 percent=5 percent of the total strength that can be maintained=5 percent of 375,000=18,750 troops.

(3) *Example 3.*

(*a*) *Problem.* Assuming the same circumstances as in (1) (*a*) above, except that the maintenance factor of 0.8 MTON per man per month is so established that maintenance can start during the following month for all troops moved initially during any 1 month, what could be the strength built up after 7 months?

(*b*) *Solution.*

1. Proceed as in (1) (*b*) above, except that in using the chart, use the *dashed* line for R=6 rather than the solid line.

2. Read cumulative strength=72 percent of the total strength that can be maintained.

3. Cumulative strength after 7 months=72 percent of 375,000=270,000 troops.

(4) *Example 4.*

(*a*) *Problem.* Initial and maintenance supplies for service forces are to be moved over a highway, the capacity of which is 10,000 STON per month. Initial equipment for these forces averages 3,350 pounds per man; maintenance averages 430 pounds per man per month. When will the size of the service force have been built up to 60 percent

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of its ultimate strength if maintenance supply must begin immediately on arrival of the forces in the theater?

(*b*) *Solution.*

1. S=60 percent of the maximum that can be supported.

2. R=3,350÷430=7.8.

3. Because no line for R=7.8 appears on the chart, it must be constructed. Observing the assumption in the problem above as to initiation of maintenance, draw a solid line through (0, 0) and the point 7.8 on scale R (in accordance with directions above).

4. Using the constructed line, as indicated in previous examples, determine for S=60 percent that T=7 months.

CHAPTER 6

LOGISTICS—EVACUATION AND HOSPITALIZATION

Section I. ESTIMATE OF PATIENTS

6–1. Classification of Patients

a. The term "patient" includes all sick, injured, or wounded personnel receiving medical care or treatment. For purposes of discussion in this chapter, only those patients who require hospitalization or who are excused from performing military duty and not returned to duty within the calendar day of admission to a medical treatment facility are considered. Patients may be classified in several ways, depending on the purpose for which classification is made. It is important to note that not all casualties or nonbattle losses are *patients.*

b. In making estimates of patients or in computing hospital bed requirements, patients are usually classified by cause of disability into *sick/disease, nonbattle accident/injury,* and *wounded or injured in action.* The latter group falls in the category of battle losses.

c. Patients may be classified as *hospital* patients or *quarters* patients.

d. In calculating evacuation requirements, patients may be classified by—

(1) Severity of disability as *ambulatory* and *litter* patients.

(2) Suitability for evacuation as *evacuable* and *nontransportable* patients.

(3) Suitability for evacuation by air.

6–2. Admission Rate

The incidence of disease, injury, and wounding is usually expressed in the Military Services in terms of the number of admissions per 1,000 average strength per year. The admission rate may be for all causes, for all diseases, for all nonbattle accidents/injuries, or for all battle wounds or injuries. For purposes of planning for hospitalization requirements, the admission rate is most conveniently expressed as a *rate of admission to hospital* per 1,000 strength per day.

6–3. Sick/Disease and Nonbattle Accidents/Injuries

Sick/disease and nonbattle accident/injury cases among combat troops of a seasoned command, except in a particularly unhealthful region, may be expected to produce a rate of admission to medical treatment facilities (hospital and quarters combined) of about 3 per 1,000 per day (0.3 percent per day). This *average* rate can be expected at certain seasons of the year, without epidemics, to reach 0.5 percent or even more. As an estimate for planning, *one-third* of these patients may be expected to remain under treatment in their own organization (at aid stations) or in the division clearing stations *if there is no interference with the primary mission of reception, treatment, and evacuation of casualties.* About two-thirds of the sick/disease and nonbattle accident/injury cases may be evacuated from the division area.

6–4. Wounded or Injured in Action

a. In estimating battle injuries and wounds, many variable factors must be considered. These include type of troops, their location in the theater, type of engagement, and enemy capabilities. For this reason, it is desirable in such estimations to separate all troops in a theater into groups having approximately the same casualty rate and compute the patients separately for each group on the basis of their numerical strength. For example, in a given theater the troops may be grouped into combat divisions, other ground troops in the combat zone, Air Force troops, and troops in the communications zone. Each of these groups will have a different battle injury and wound rate, and the total patients in the theater will depend on the relative strength of each group.

b. In estimating battle injury and wound patients in a field army, an estimate based on combat

divisions engaged usually is more accurate than one based on a rate for corps or the field army.

c. Considerable variation in battle injury and wound admission rates among Air Force troops occurs, depending on the type of aircraft, type of mission flown, and amount of enemy air resistance. As an overall average, which necessarily must be modified to apply to any special situation, the battle injury and wound admission rate for all air troops can be taken as 0.2 per 1,000 per day. More commonly, casualties in Air Force troops are computed on the basis of the number of man-missions flown.

d. The number of battle injuries and wounds among communications zone troops, except in special situations, has been negligible in the past. However, in future warfare the possible use of sophisticated conventional weapons and nuclear weapons or both in rear areas must be considered in estimating patient workloads.

6–5. Statistics

Table 6–1 indicates estimated hospital admission rates for broad geographic areas based on World War II and Korean War experience and subsequent study of the world health situation. These rates should be used only as a basis for planning gross theater-level medical service support. Each rate represents a first-year experience typical of the area involved. (When data are aggregated for greater or lesser periods, the same experience source produces significantly different rates.) The medical planner must modify these rates, using the latest pertinent medical intelligence data, before he applies them in developing medical workloads and bed requirements for a specific plan or campaign.

*Table 6–1. Rate of Admission to Hospital Per 1,000 Strength Per Day**

1	1 Area	2 Sick/disease and nonbattle accidents/ injuries	3 Wounded or injured in action
2	North America	1. 36	0. 55
3	Europe	1. 62	0. 55
4	Asia	2. 07	0. 37
5	Africa	2. 87	0. 37
6	Middle East	1. 96	0. 37
7	South America	1. 72	0. 37

*In using experience factors from theaters of operation, it must be borne in mind that wounded or injured in action rates are not primarily related to geography. In using such rates for planning purposes, it is necessary to consider the theater from the standpoint of type combat, size and organization of forces, and weapon employment.

6–6. Accumulation Factors

In estimating the hospital inpatient workload that will develop in a planned operation, it is necessary to know the rate at which hospital patients accumulate. The accumulation factor depends on two considerations. First, the length of treatment time varies considerably according to types of patients admitted. Second, the maximum length of time allowed for patient stay in an oversea hospital is limited by the applicable theater evacuation policy. Accumulation factors (table 6–2) indicate how many patients will have accumulated at specified periods of time after the beginning of operations, based on a constant admission rate of one patient per day and a constant, fixed evacuation policy. Separate sets of factors are provided for the different evacuation policies and for separate theater and continental United States (CONUS) accumulation of patients as affected by these evacuation policies.

6–7. Evacuation Policy

The Secretary of Defense establishes the evacuation policy of a joint theater of operations, usually on the recommendation of the Joint Chiefs of Staff, theater commander, or the Military Departments. The evacuation policy determines which patients will be evacuated to the CONUS by designating a maximum number of days for the allowable period of hospitalization in the theater. Patients who, in the opinion of responsible medical officers, cannot be returned to duty status within the period prescribed are to be returned to the CONUS by the first available and suitable transportation, provided travel will not aggravate their disabilities. In using the evacuation policy to determine theater fixed-bed requirements, the periods usually considered are 30, 60, 90, or 120 days.

a. Evacuation policies within a theater may be established for certain areas and for certain types of medical facilities, specifying which patients will be evacuated to the next higher echelon of medical care. For example, a shorter evacuation policy may be established for station hospitals than for the theater as a whole. This means that patients admitted to station hospitals whose recovery is likely to require more than the number

Table 6–2. Accumulation Factors (Periods of Estimate in Intervals of 30 Days)*

1	Periods of estimate	2	3	4	5	6	7	8	9	10	11	12
		THEATER FACTORS										
		Evacuation policies										
1.	Periods of estimate	120-day		90-day		60-day		30-day		15-day		Periods of estimate
		Sick/disease and nonbattle accidents/ injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/ injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/ injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/ injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/ injuries	Wounded or injured in action	
2	30	13. 43	22. 96	13. 34	22. 39	13. 11	21. 04	11. 40	16. 44	7. 32	10. 80	30
3	60	16. 46	33. 38	15. 95	31. 00	14. 67	25. 57	11. 40	16. 44	7. 32	10. 80	60
4	90	17. 67	37. 36	16. 51	32. 87	14. 67	25. 57	11. 40	16. 44	7. 32	10. 80	90
5	120	17. 94	38. 27	16. 51	32. 87	14. 67	25. 57	11. 40	16. 44	7. 32	10. 80	120
6	150 and over	17. 94	38. 27	16. 51	32. 87	14. 67	25. 57	11. 40	16. 44	7. 32	10. 80	150 and over
		CONUS FACTORS										
7	30	0. 13	1. 55	0. 22	2. 12	0. 45	3. 47	2. 16	8. 07	6. 24	13. 71	30
8	60	0. 76	6. 88	1. 27	9. 26	2. 55	14. 69	5. 82	23. 82	9. 90	29. 46	60
9	90	1. 80	13. 43	2. 69	17. 92	4. 80	25. 22	8. 07	34. 35	12. 15	39. 99	90
10	120	3. 06	20. 35	4. 49	25. 75	6. 33	33. 05	9. 60	42. 18	13. 68	47. 82	120
11	150	4. 05	26. 59	5. 48	31. 99	7. 32	39. 29	10. 59	48. 42	14. 67	54. 06	150
12	180	4. 67	31. 66	6. 10	37. 06	7. 95	44. 36	11. 21	53. 49	15. 29	59. 13	180
13	210	5. 05	35. 86	6. 48	41. 26	8. 32	48. 56	11. 59	57. 69	15. 67	63. 33	210
14	240	5. 29	39. 40	6. 72	44. 80	8. 56	52. 10	11. 83	61. 23	15. 91	66. 87	240
15	270	5. 44	42. 37	6. 87	47. 77	8. 71	55. 07	11. 98	64. 20	16. 06	69. 84	270
16	300	5. 54	44. 89	6. 97	50. 29	8. 81	57. 59	12. 08	66. 72	16. 16	72. 36	300
17	330	5. 60	47. 02	7. 03	52. 42	8. 87	59. 72	12. 14	68. 85	16. 22	74. 49	330
18	360	5. 64	48. 79	7. 07	54. 19	8. 91	61. 49	12. 18	70. 62	16. 26	76. 26	360
19	390	5. 67	50. 26	7. 10	55. 66	8. 94	62. 96	12. 21	72. 09	16. 29	77. 73	390
20	420	5. 70	51. 46	7. 13	56. 86	8. 97	64. 16	12. 24	73. 29	16. 32	78. 93	420
21	450	5. 71	52. 39	7. 14	57. 79	8. 98	65. 09	12. 25	74. 22	16. 33	79. 86	450
22	480	5. 72	53. 14	7. 15	58. 54	8. 99	65. 84	12. 26	74. 97	16. 34	80. 61	480
23	510	5. 73	53. 71	7. 16	59. 11	9. 00	66. 41	12. 27	75. 54	16. 35	81. 18	510
24	540	5. 73	54. 16	7. 16	59. 56	9. 00	66. 86	12. 27	75. 99	16. 35	81. 63	540
25	570	5. 73	54. 52	7. 16	59. 92	9. 00	67. 22	12. 27	76. 35	16. 35	81. 99	570
26	600	5. 73	54. 79	7. 16	60. 19	9. 00	67. 49	12. 27	76. 62	16. 35	82. 26	600
27	630 and over	5. 73	55. 00	7. 16	60. 40	9. 00	67. 70	12. 27	76. 83	16. 35	82. 47	630 and over

*Based on constant admission of one per day under stated evacuation policies.

of days in the shorter policy will be evacuated to general hospitals. This operation in no way affects the total fixed-bed requirements of the theater, provided proper adjustment is made in the distribution of total theater fixed beds between station and general hospitals on the basis of their different evacuation policies.

b. Certain flexible evacuation policies, useful as guides but varying with manpower policies, admission rates, and available beds, may be established for the combat zone.

c. By setting a maximum number of days a patient may be retained in theater hospitals, the evacuation policy exercises a limiting effect on the growth of the patient load in the theater. While the evacuation policy alone does not enter directly as a computational factor in the estimation of fixed-bed requirements, it does determine which set of accumulation factors it is appropriate to use.

6–8. Dispersion Factor

At any given time a certain proportion of theater fixed beds will not be immediately available to patients because of "dispersion." (A 20-percent allowance for dispersion was generally used during World War II.) Factors contributing to dispersion are as follows:

a. A certain number of beds must be packed and in transit. The greater the mobility of the troops, the greater the allowance required.

b. Smaller troop units operating at some distance from the main body of troops must be supported by complete hospital units, even though these units are not likely to use fully the hospital facilities provided.

c. The general practice of prescribing separate wards for patients of different sexes, cases of contagious diseases, and cases requiring different types of treatment necessitates a safety margin in each ward because the proportion of the various cases will vary from time to time.

d. Factors to be applied to the number of patients to convert to the number of fixed beds required under each specified dispersion allowance are as follows:

Dispersion allowance (percentage)	*Dispersion factor*
5	1.05
10	1.11
15	1.18
20	1.25
25	1.33
30	1.43
35	1.54
40	1.67
45	1.82
50	2.00

6–9. Disposition Factors

The factors in table 6–3, expressed as percentage of total hospital admissions, may be used to develop gross theater-level estimates for disposition of sick/disease and nonbattle accident/injury patients and of battle injury and wound patients for each of the specified theater evacuation policies. Data for detailed calculations of disposition under various policies are given in FM 8–55.

Table 6–3. Disposition Factors

1	1 Evacuation policy	2	3	4	5	6	7
		Sick/disease and nonbattle accidents/injuries			Wounded or injured in action		
		Died	Returned to duty	Evacuated from theater	Died	Returned to duty	Evacuated from theater
2	180-day	0.21	96.85	2.94	2.07	81.76	16.17
3	150-day	0.20	96.71	3.09	2.06	78.81	19.13
4	120-day	0.19	95.08	4.73	2.05	74.55	23.40
5	90-day	0.18	93.39	6.43	2.03	68.11	29.86
6	60-day	0.17	90.59	9.24	1.95	56.05	42.00
7	30-day	0.15	82.55	17.50	1.88	32.12	66.00
8	15-day	0.14	62.36	37.50	1.74	16.52	81.74

Section II. FIXED-BED REQUIREMENTS

6–10. Basic Data

a. Methodology. For planning purposes, requirements for fixed beds in a theater of operations can be determined by using a factor of 4 percent of the theater of operations strength. This method is recommended for planning for an entire theater of operations only and is not applicable for individual segments of any theater. Computation of fixed-bed requirements for specific situations, or in cases that require more detailed data, should be made using the method described in paragraphs 6–11 and 6–12.

b. General. To compute bed requirements for any specific situation, certain basic data are necessary. These are—

(1) Time period covered. (Period of estimate, usually 30-day intervals.)
(2) Troop strength. (Population covered.)
(3) Daily admission rate. (Rate of generation of patients.)
(4) Experience factors for accumulation of patients, dependent on evacuation policy. (Rate of patient-load growth.)
(5) Dispersion factor. (Patient-bed conversion factor.)

All experience factors ((4) above) are based on the proportion of patients out of those admitted to hospital on 1 day and still remaining on each succeeding day. When these daily remaining factors (proportions) are accumulated by intervals of 30 days, the resultant accumulation factors can be used directly, provided the admission rate, troop strength, and evacuation policy are assumed to be constant. However, when any or all elements of admission rate, troop strength, or evacuation policy vary for one or more of the 30-day intervals in the time period covered, the daily remaining factors may be accumulated through a 30-day period, at which time admissions cease, and then decumulated each succeeding day thereafter. For tables of factors to be used for such computations and their detailed method of use, see FM 8–55.

6–11. Computations

a. Given the items of basic data, the fixed-hospital bed requirements for a specific situation, wherein the elements of admission rate, troop strength, and evacuation policy are assumed to be constant during the time period covered, can be computed according to the following formula:

Daily admission rate × Average strength (thousands) × Accumulation factor at time period covered in estimate × Dispersion-factor = Fixed beds

Example: Theater "A" has a troop strength of 500,000. Expected daily admission rates per 1,000 are as follows: sick/disease and nonbattle accidents/injuries, 0.73; conventional battle injuries and wounds, 0.34. Theater evacuation policy is 120 days and the dispersion allowance is 20 percent. How many fixed-hospital beds will be required at the end of 90 days?

	Admission rate		*Troop strength (thousands)*		*Accumulation factor (90 days)*		*Dispersion factor*		*Fixed beds*
Sick/disease and nonbattle accidents/injuries	0.73	×	500	×	17.67	×	1.25	=	8,062
Conventional battle losses	0.34	×	500	×	37.36	×	1.25	=	7,939
Total fixed beds required at the end of 90 days									16,001

In the above example, the accumulation factors were obtained from table 6–2. The proper accumulation factor is shown on line 4 in both instances—column 2 for sick/disease and nonbattle accident/injury patients and column 3 for battle injury and wound patients.

b. Nuclear, Biological, and Chemical Operations. While the preceding computations afford a relatively sound basis for determining fixed-bed requirements, nuclear, biological, and chemical operations introduce other factors. The experience factors in this chapter have been derived in the presence of a certain pattern of wounding and are related to average admission rates over long periods. The pattern of wounding from nuclear, biological, and chemical munitions will probably alter accumulation factors. Of greatest significance, however, may be the characteristically wide fluctuation of daily admission rates resulting from these munitions. This characteristic may make any attempt to employ average admission rates futile. The problem will be one of handling recurring peakloads of patients. This problem must be met either by efficient use of theater hospital facilities or by rapid and extensive evacuation to the CONUS. For this reason, the planner may find it more realistic to submit fixed-bed requirements as a feasible percentage of troop strength supported and build the maximum flexibility into the resulting medical service. There are, however, factors and methods for estimating hospitalization and evacuation requirements. For data pertaining to nuclear warfare, see FM 101–10–3, chapter 5.

6–12. Continental United States

a. Fixed beds are required in the CONUS for those troops who do not depart for theaters of operations. When new recruits are inducted in large numbers, morbidity tends to be rather high, and beds equal in number to as much as 4 percent of the CONUS strength may be necessary. After the period of training is over, beds equal in number to 3 percent of the CONUS strength may be sufficient.

b. It is also necessary to compute bed requirements for those cases evacuated from theaters of operation. These additional beds are estimated on the basis of the expected numbers of evacuees arriving in the CONUS (sick/disease and nonbattle accident/injury and battle injury and wound cases are considered separately) and the average duration of stay of such cases in CONUS hospitals (table 6–4).

*Table 6–4. Accumulation of Theater of Operations Patterns in CONUS Hospitals (120-Day Evacuation Policy)**

1	1	2	3	4	5	6	7	8
1	Cause of admission	Daily hospital admission rate per 1,000	Accumulation of theater patients in CONUS hospitals per 1,000 theater strength after number of days indicated following start of operations in the theater					
			60	90	120	180	260	540
2	Sick/disease and nonbattle accidents/injuries	1. 0	0. 60	1. 07	1. 50	3. 11	4. 08	4. 17
3	Wounded or injured in action	0. 6	2. 05	5. 20	8. 79	16. 32	26. 43	28. 48
4	Total patients		2. 65	6. 27	10. 29	19. 43	30. 51	32. 65
5	Increase by 26 percent		0. 66	1. 57	2. 57	4. 86	7. 63	8. 16
6	Total beds required		3. 31	7. 84	12. 86	24. 29	38. 14	40. 81

*Based on July to December 1944 ETO admission rates.

c. Using the data given for the problem in paragraph 6–11*a*, the accumulation of theater of operations patients in CONUS hospitals after 90, 150, and 360 days of operation in the theater (under a 120-day evacuation policy) may be determined as follows:

	Daily admission rate		*Troop strength (thousands)*		*Accumulation factors* 90 days	150 days	360 days
Sick/disease and nonbattle accidents/injuries	0. 73	×	500	×	1. 80	4. 50	5. 64
Conventional battle losses	0. 34	×	500	×	13. 43	26. 59	48. 79
Total patients—							
Sick/disease and nonbattle accidents/injuries					657	1, 478	2, 059
Battle injuries and wounds					2, 283	4, 520	8, 294
					2, 940	5, 998	10, 353
Dispersion allowance 20 percent				×	1. 25	× 1. 25	× 1. 25
Total beds required					3, 675	7, 498	12, 941

In the above example, the accumulation factors were obtained from table 6-2, lines 9, 11, and 18, respectively—column 2 for sick/disease and nonbattle accident/injury patients and column 3 for battle injury and wound patients.

d. To the above figures must be added an allowance, when appropriate, for care of Navy, Air Force, and allied military personnel; allied civilians; and prisoners of war. The additional number of fixed beds for such purposes will depend on the particular area involved, and no definite figures can be given.

Section III. PATIENT EVACUATION

6-13. Planning Factors

Percentages of personnel evacuated from theater out of admissions during 1 month of operations are shown in tables 6-5 and 6-6.

6-14. Capacity of Transportation

The capacity of selected items of transportation equipment for evacuating patients is shown in table 6-7.

a. Exact figures for Army aircraft in columns 2 and 3 must be computed on maximum gross weight.

b. Combat vehicles are used only when ambulances are not available.

6-15. Time Elements of Evacuation

Factors for evacuation of personnel (including loading and unloading) are indicated in *a* and *b* below.

a. Litter Squads.

(1) Average terrain, four-man squad—900 meters and return in 1 hour.

(2) Mountainous terrain, six-man squad—370 meters and return in 1 hour.

b. Ambulance, Motor, During Combat in Division Area. Eight kilometers one way and return in 1 hour.

(1) *Helicopter.* Eighty kilometers one way in 1 hour.

(2) *Transport airplane.* One hundred and sixty kilometers one way in 1 hour.

(3) *Army airplane.* One hundred and twenty kilometers one way in 1 hour.

Table 6-5. Sick/Disease and Nonbattle Accidents/Injuries Evacuated From Theater

1	1	2	3	4	5	6	7
	Evacuation policy	Percentage during specified interval					
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	Total evacuated from theater
2	120-day	0.44	1.73	1.49	0.88	0.19	4.73
3	90-day	0.74	2.83	2.26	0.60		6.43
4	60-day	1.51	5.57	2.16			9.24
5	30-day	7.22	10.08				17.30
6	15-day	26.89	10.61				37.50

Table 6-6. Wounded or Injured in Action Evacuated From Theater

1	1	2	3	4	5	6	7
	Evacuation policy	Percentage during specified interval					
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	Total evacuated from theater
2	120-day	5.15	12.62	4.06	1.34	0.23	23.40
3	90-day	7.07	16.74	5.07	0.98		29.86
4	60-day	11.56	25.84	4.60			42.00
5	30-day	26.90	39.10				66.00
6	15-day	49.99	31.75				81.74

Table 6–7. Capacity of Transportation for Patient Evacuation

1	1 Type of transportation	2 Patients Ambulatory	3 Patients Litter
2	Transport airplane (C–119) [a]	40	35
3	Transport airplane (C–124) [a]	163	103
4	Transport airplane (C–130) [a]	85	70
5	Transport airplane (C–141) [a]	133	80
6	Transport airplane (C–7A) [a]	30	20
7	Army airplane (U–6A)	5	4
8	Army airplane (U–8D)	4	----
9	Army airplane (O–1A)	1	----
10	Army helicopter (OH–13H)	2	2
11	Army helicopter (UH–19D)	10	6
12	Army helicopter (CH–21C)	20	12
13	Army helicopter (OH–23C and D)	2	2
14	Army helicopter (CH–34C)	18	8
15	Army helicopter (CH–37B)	23	24
16	Army helicopter (UH–1B)	5	3
17	Army helicopter (UH–1D)	9	6
18	Army helicopter (CH–47A)	31	24
19	Bus, motor, 37-passenger, convertible	37	18
20	Truck, ambulance, frontline, ¼-ton, 4x4	5	3
21	Truck, ambulance, field, ¾-ton, 4x4	8	4
22	Truck, cargo, 2½-ton, 6x6	16	18
23	LARC–5	[b] 25	12
24	LARC–60	125	----
25	Railway car, coach (U.S.)	52	----
26	Railway car, coach (foreign)	57–72	----
27	Pullman car (U.S.)	48	32
28	Sleeping car (foreign)	32	32
29	Ambulance car, ward (U.S.)	27	27
30	Ambulance car, ward (foreign)	24	30
31	Ambulance car, personnel (foreign)	21	21
32	LVT	12	6
33	LVTP–5	34	----
34	LVTP–6	20	----
35	LCVP	36	[c] 17
36	LCM (6)	120	30
37	LCM (8)	[d] 200	[e] 50
38	LCU	400	100
39	LST	180	120
40	Hospital ship (AH)	802	802

[a] Based on capacity.
[b] No troop seats provided.
[c] Only seven litters if LCVP is to be hoisted aboard for loading.
[d] In addition to litter patients.
[e] In addition to ambulatory patients.

CHAPTER 7

LOGISTICS—TRANSPORTATION

Section I. GENERAL

7–1. Chapter Contents

This chapter contains detailed unclassified data on transportation capabilities and methods of computing transportation requirements. The chapter presents a section on general transportation planning and a separate section on each of the major means of transportation required to support military operations. (For classified data pertaining to transportation, see FM 101–10–3, ch 5.)

7–2. Transportation Estimates and Plans

a. Transportation estimates and plans are necessarily dependent on the transportation user, whose firm requirements are often not available until after tactical plans and supply service plans have been completed. For transportation planners to plan concurrently with other staff agencies, it is often necessary that they adopt methods of using troop strength and requirement factors that permit a reasonable estimate of transportation requirements in broad terms, to be defined later in terms of class and service (or item) of supplies and categories of personnel or troop units.

b. Transportation planning embraces the following:

(1) Surveying existing and potential facilities for movement of troops and supplies.

(2) Selecting the available means of movement that provide the greatest flexibility, based on a study of existing and potential facilities.

(3) Planning for the maximum use of carrying capacity.

(4) Insuring that the transportation plan provides for flexibility.

7–3. Capabilities of Lines of Communications

a. The capabilities of lines of communications are quantitative statements of the ability of the lines to transport cargo or troops and are usually expressed in tons (long tons (LTON) or short tons (STON)) or troops per day. Frequently, troops per day may be equated to tons per day to provide a common unit of measure. A ton-kilometer is the actual movement of 1 ton 1 kilometer.

b. Transportation capabilities are dependent on the following:

(1) Number, lift capacities, and speed of available transportation mediums.

(2) Environmental factors (terrain, climate, etc) influencing the operational characteristics of the transport vehicles.

(3) Distances between origins and destinations.

(4) Loading and unloading capabilities.

(5) Maintenance capabilities.

(6) Turnaround time (time required for one vehicle to complete one cycle). This is dependent on the above factors as well as on refueling time and other incidental time consumed in the normal operation of the means.

(7) Critical density. This refers to the number of vehicles that will provide the maximum tonnage rate over a line of communications during a specified period, considering the above factors.

(8) Efficiency of management, operating, and maintenance personnel.

c. Efficiency of management is an intangible factor, which may enter arithmetical calculations of capability only by experience or estimate. Such efficiency is dependent on number and skill of operating personnel, degree of intelligent movement planning, and effectiveness of operating technique.

7–4. Advance Transportation Planning Factors

When it is desirable to obtain an estimate of transportation requirements well in advance of detailed planning, table 7–1 and the general averages shown below may be used.

Table 7-1. Typical Shipping Requirements for an Assault Division Slice of 25,000 Men

1	1 Type	2 Long voyage (10 days)	3 Short voyage (2-3 days)
2	APA (transport, attack)	6	3
3	AKA (cargo ship, attack)	15	6
4	LST (landing ship, tank)	26	45
5	LSD (landing ship, dock)	7	16
6	LPH (landing platform, helicopter).	4	4

a. Cargo Ships.

Capacity	5,600 STON or Army cargo.
Discharge rate	720 STON per day discharging alongside berth.
Beach capacity	1,860 STON per 1,000 meters of beach per day.
Light amphibian (LARC-5) company capacity.	720 STON per company per day
Loading rate	500 STON per day loading alongside berth or in stream.
Medium boat company	720 STON per company per day capacity.
Heavy boat company	1,440 STON per company per day capacity.

b. Water Terminal and Beach Operations. Unless other factors govern to provide dispersion and to present less favorable targets to the enemy, plans should provide for the discharge of not less than 40 percent of tonnage over the beach and through shallow-draft facilities. As friendly capabilities decrease and as the destructive magnitude of enemy weapons increases, this over-the-shore proportion should be increased to reduce dependence on major water terminals to support military operations.

c. Percentage of Organizations and Supply Moved in Assault or Cargo Craft in Amphibious Operations. Supply as used below refers to accompanying supply. After the assault phase supply is by cargo shipping only, except for emergency supply. Percentages are as follows (to be used only when assault lift is not known):

(1) Eighty percent of the total personnel is moved in assault naval shipping.

(2) Twenty percent of the total personnel is moved in cargo-type shipping.

(3) Sixty percent of the organizational equipment and supplies for units moved in assault naval shipping accompanies the units transported in that shipping.

(4) Forty percent of the organizational equipment and supplies for units moved in assault naval shipping is transported in cargo-type shipping.

(5) Because of space or other factors, it sometimes is not possible to move all the organizational equipment and supplies of a unit on the same ship. These supplies and equipment, in such case, may be moved on another ship of the same convoy, provided sufficient personnel from the parent unit accompany them.

d. Railways (Foreign Countries).[1]

(1) *Standard gage* (1.435-m (56½-in)).

Single-track.	10 trains (4,000 STON) per day in each direction (supports six divisions).
Double-track.	30 trains (12,000 STON) per day in each direction (supports 18 divisions).
Trainload	400 STON of cargo (20 cars at 20 tons each) 1,000 troops (40 boxcars at 25 troops each).

(2) *Narrow gage* (0.91-m (36-in), 1.00-m (39⅜-in), and 1.067-m (41-in)).

Single-track	10 trains (3,000 STON) per day in each direction.
Trainload	300 STON of cargo (20 cars at 15 tons each) or 500 troops (20 boxcars at 25 troops each).

e. Highways (Supply Traffic in Combat Zone).

(1) Highway tonnage capability is as follows:[2] [3]

Dirt	1,600 STON per day forward.
Gravel	3,400 STON per day forward.
Bituminous-treated	5,800 STON per day forward.
Bituminous	7,300 STON per day forward.
Concrete	8,400 STON per day forward.

(2) A hard-surface, two-lane road of high-type asphalt, macadam, or equivalent will support a corps of four or five divisions.

[1] For planning purposes new carload (payload) is computed at 50 percent of its rated capacity. U.S. equipment oversea box, gondolas, and flatcars, 40 tons rated capacity (standard gage); 30 tons rated capacity (narrow gage).

[2] No exact formula has been developed for determining the capabilities of various types of roads and highways because of various factors that must be considered. These capabilities are based on the following assumptions:

a. Operation is sustained.

b. Necessary road maintenance is performed.

c. Each road bears two lanes of traffic, permitting movement in both directions.

d. Standard cargo trucks, 2½-ton, 6x6, are used.

e. Two-thirds of the capability of the road is used for civil and military traffic normal to a theater of operations.

[3] Reductions for width, alinement, and weather have not been applied (para 7-13).

(3) Trucks required to move the foot troops of an infantry division—219 vehicles less any available vehicles from the infantry division supply and transport battalion (in one lift).

(4) A transportation light truck company (TOE 55–17) at strength level 1, equipped with 2½-ton, 6x6 cargo trucks, with 45 available vehicles making four round trips per day, can transport in local hauls 720 STON of cargo (4 tons per truck) on highway, or 3,600 passengers (20 passengers per truck) on or off highway. In line hauls, with 45 trucks available making two round trips per day (one per 10-hour shift), the company can transport 360 STON of cargo (4 tons per truck) on highway, or 1,440 passengers (16 per truck) on or off highway. In one lift, off highway, with 45 trucks available, the company can transport 112.5 STON of cargo (2½ tons per truck).

(5) A transportation light truck company (TOE 55–17) at strength level 1, equipped with 5-ton, 6x6 cargo trucks, with 45 available vehicles making four round trips per day, can transport in local hauls 1,080 STON of cargo (6 tons per truck) or 3,600 passengers (20 passengers per truck) on or off highway. In line hauls, with 45 trucks available making two round trips per day (one per 10-hour shift), the company can transport 540 STON of cargo (6 tons per truck) on highway, or 1,620 passengers (18 per truck) on or off highway. In one lift, off highway, with 45 trucks available, the company can transport 225 STON of cargo (5 tons per truck).

f. Pipelines. For pipeline transfer and movement capabilities, see paragraph 7–14 and TM 5–343.

g. Air Transportation. For data pertaining to the determination of aircraft requirements to transport the Army divisions, or organic units thereof, by air, see paragraph 7–36, FM 61–100, and TM 57–210.

Section II. TERMINALS

7–5. General

a. Types. A terminal is a military or commercial facility used for the loading, unloading, and in-transit handling of cargo or personnel by any of the various means of transportation. Normally, terminals also contain other facilities essential to the operation of the means, such as maintenance facilities, classification yards, dock and lighterage facilities, management offices, storage facilities, and freight and passenger loading and unloading facilities as required. The three types of terminal treated in this section are—

(1) Water terminals.
  (*a*) Ports.
  (*b*) Beaches.
(2) Inland terminals.
(3) Air terminals.

b. Elements of Terminal Planning. There are normally five steps in terminal planning.

(1) *Step 1.* Computation of the terminal workload required to support the operation, expressed as cargo tonnage and number of personnel per day.

(2) *Step 2.* Estimation of the existing terminal capacity, which is the total tonnage and personnel that can be *received*, *processed*, and *cleared* through the terminal in a day.

(3) *Step 3.* Estimation of construction requirements, which are the requirements for repair and rehabilitation of existing facilities and construction of new facilities necessary to increase the existing terminal capacity to equal the required terminal workload.

(4) *Step 4.* Estimation of the equipment requirement, which is the amount of equipment needed to process the required workload through the terminal with maximum efficiency.

(5) *Step 5.* Estimation of personnel requirements, which are the units and individuals needed for administration and operation in processing the required workload through the terminal.

7–6. Water Terminals (Ports)

a. General. This paragraph deals with planning data for water terminals in the hands of the enemy that will be opened for operation as soon as cleared. For this reason data are based on the employment of Army personnel and ships' gear only for the unloading of ships. Appropriate allowances should be made for other circumstances, such as availability of civilian labor and terminal facilities (e.g., gantry cranes, barges, railways). Discharge of dry cargo from ships is accomplished by one of two methods—either from vessels alongside a wharf onto the wharf or by lighters from a ves-

sel anchored astream. Petroleum tankers are discharged at wharfside or offshore by submarine pipelines. Throughout the discussion of water terminals, the basic period of time is a 20-hour day. This is generally considered a complete round-the-clock working day in terminal operations; the other 4 hours of the day are taken up in delays inherent in the work, such as breakdowns, waiting for trucks, changing shifts, and meals. (For planning terminal discharge in forward areas when enemy action may be expected to cause work delays, 15 hours' working time per day may be estimated. Factors used may be reduced proportionately.) For general planning purposes the transportation terminal service company (TOE 55-117) is considered capable of discharging 720 STON per 20-hour working day.

b. Water Terminal Capacity Estimation.

(1) *Factors.* Terminal throughput capacity is determined by three major factors. Each of the three factors may be expressed in terms of STON per day for planning and estimating purposes. All three factors should be accurately estimated even though the limiting factor may be obvious. These estimates indicate the facilities where improvement effort will yield the greatest return in terms of tonnage movement capability. The three major factors are—

(*a*) Terminal reception capacity; that is, the number and type of ships that can be moved into the harbor or coastal area of the terminal per day. This capacity is an estimated tonnage that can be discharged daily from ships and is based solely on an evaluation of the physical facilities of the terminal.

(*b*) Terminal discharge capacity; that is, the number of ships that can be discharged in the terminal per day. This capacity is based on the equipment and terminal service units available.

(*c*) Terminal clearance capacity; that is, the amount of cargo and personnel that can be moved through and out of the terminal per day. This capacity is based on the transportation available for the movement of supplies from the terminal to depots or consumers.

(2) *Checklist for water terminal capacity estimation.*

Collect and evaluate these data	*Compute these factors*	*Determine this figure*
1. Channel depths	(*a*) Evaluate to determine water terminal reception capacity.*	Water terminal throughout capacity.
2. Obstructions		
3. Enemy air activity		
4. Enemy surface activity		
5. Enemy submarine activity		
6. Climate		
7. Weather		
8. Minefields or contaminated areas		
9. Our own capabilities in combating obstacles		
1. Tactical dispersion requirements	(*b*) Evaluate to determine water terminal discharge (input) capacity.	
2. Wharf facilities		
3. Beach capabilities		
4. Discharge rates ashore		
5. Discharge rates astream		
6. Anchorage area		
7. Extent of destruction or contamination		
8. Climate and seasons		
9. Weather and tide characteristics		
10. Cargo-handling equipment available		
11. Floating craft and equipment available		
12. Transit sheds and areas		
13. Availability of indigenous labor		
14. Space reserved for local economy		
15. Enemy activity		
1. Capacity of rail facilities	(*c*) Add to determine water terminal clearance (output) capacity.	
2. Capacity of highway facilities		
3. Capacity of inland waterway facilities		
4. Capacity of pipeline facilities		
5. Capacity of air facilities		
6. Enemy activity		

*To determine terminal reception capacity ((*a*) above), collect and evaluate data items 1 through 9 plus data items 1, 6, 7, 9, 14, and 15 of (*b*) above. When wharf and beach facilities are used for the physical accommodations of ships, data items 2 and 3 of (*b*) above should also be considered.

(*a*) These data will probably be obtained from Navy sources (para 7-43 through 7-49).

(*b*) Paragraph 7-7 contains information on beaches.

(*c*) Capabilities of transport services—pipeline, inland waterway, rail highway, air—are indicated in paragraphs 7-10 through 7-26 and 7-36 through 7-42.

c. Wharf Facilities.

(1) *General.* Because only two methods of dry cargo discharge are available (*a* above), planners must consider wharf facilities for alongside and lighter discharge. The Victory-type ship having five hatches is used as a basis for all discharge. It was selected because it so closely meets the average characteristics of a nominal ship. Deep-draft wharfage must be provided whenever *alongside* discharge is contemplated. Shallow-draft wharfage and anchorage areas must be given joint consideration when lighter discharge is contemplated. Factors governing wharfage are in (2) and (3) below. The term "wharf" is used throughout in its general meaning, i.e., a structure used to aid in the berthing, loading, and discharge of a vessel. Specific definitions of ship berthing facilities are as follows:

(*a*) *Wharf*—A projecting platform of timber, stone, or other material that extends into water deep enough for vessels to be accommodated alongside for loading or unloading.

(*b*) *Quay*—A wharf parallel with the shoreline of a basin or harbor with water and accommodations for ships on one side only.

(*c*) *Pier*—A wharf that projects into the harbor or basin with water and accommodations for ships on both sides.

(2) *Deep-draft wharf requirements.* A wharf is classified as deep draft when the water alongside is deep enough to permit a fully loaded ship to tie up alongside. The following criteria govern:

(*a*) *Water depth.* Water depth should be not less than 10 meters at low tide. A minimum of 10 meters is used for planning purposes since this will accommodate virtually all deep-draft vessels.

(*b*) *Length for Victory-type ship, 150 meters.* Each hatch (five per vessel) requires 30 meters of wharf. When wharves are more than 150 meters' long and less than the next higher 150-meter unit, the odd footage is disregarded in determining the number of berths available (i.e., 360 meters will accommodate only two ships at the same time). However, the extra 60 meters can be considered for lighterage use ((3) below).

(*c*) *Width.* Width should be from 18 to 27 meters for discharge on one side of wharf only and 27 meters and more for discharge on both sides of wharf. For planning and estimating purposes a wharf should be from 18 to 27 meters' wide to allow sufficient working space to discharge cargo from a ship. For a pier where two vessels can tie up at the same time, one on each side, it is recommended that the width be 27 meters or more for efficient discharge.

(3) *Lighterage wharf requirements.*

(*a*) *General.* Any wharf may be used for lighter discharge if the water depth is sufficient for the type of lighterage being used. It may include wharfage that dries out at low tide but which can be used half the time, or 10 hours per day.

(*b*) *Length for lighter.* Wharfage length for a lighter should be 30 meters. Length of wharfage more than 30 meters and less than the next higher 30-meter unit is disregarded (i.e., a 110-meter wharf will handle three lighters at the same time).

(*c*) *Width.* Width should be a minimum of 10 meters for discharge on one side and 13 meters for discharge on both sides of pier.

d. Discharge Rates.

(1) *Per ship berth (Victory type).* Seven hundred and twenty STON per 20-hour day (five hatches at 7.2 STON per hatch per hour).

(2) *Per lighter berth.* One hundred and eighty STON per 20-hour day (1.8 STON per linear foot or 5.9 tons per linear meter of wharf per 20-hour day).

(3) *Per roll-on/roll-off berth (Comet type).* One thousand STON of cargo loaded in semitrailers per hour.

e. Anchorage Areas. Anchorage areas are defined as sheltered areas inside or near a harbor, unaffected by swell, where ships may anchor and discharge by lighter.

(1) *Depth.* Minimum 10 meters; maximum 65 meters. The minimum depth is dictated by the draft of the ship and the maximum by the length and weight of the anchor chain. Installed facilities, such as mooring buoys, may modify maximum depth limitations.

(2) *Free-swinging anchorage area.* Two hundred and forty-five meters' radius circle.

(3) *Moored bow and stern.* Variable; this method is not preferred because it can be used only in areas unaffected by tidal currents.

f. Estimate of Water Terminal Operating Personnel and Equipment.

(1) *General.* To insure maximum efficiency in terminal operations, a balanced operating force and suitable equipment must be available. Extreme care must be exercised during both the planning phase and the operational phase to insure that a balance is established and maintained. The possibility of using civilian and prisoner-of-war labor should not be overlooked, particularly in later expansion of the water terminal.

(2) *Operating personnel.* Operating personnel are divided into managing, or supervisory, elements (such as headquarters and headquarters company, terminal brigade and group) and functional operating units. In this last category may be included terminal service companies or battalions, truck companies, engineer units, watercraft units, and such other units particularly suited for the functioning of any particular water terminal. Units commonly found in a water terminal are as follows:

(*a*) Headquarters and headquarters company, transportation terminal brigade (TOE 55–111).

(*b*) Headquarters and headquarters company, transportation terminal group (TOE 55–112).

(*c*) Headquarters and headquarters company, transportation terminal battalion (TOE 55–116).

(*d*) Transportation lighterage direct support maintenance company (TOE 55–158).

(*e*) Transportation terminal service company (TOE 55–117).

(*f*) Transportation medium boat company (TOE 55–128).

(*g*) Transportation heavy boat company (TOE 55–129).

(*h*) Transportation amphibian maintenance (direct support) detachment, team BA (TOE 55–510).

(*i*) Transportation light amphibian company (TOE 55–138).

(*j*) Transportation floating craft general support maintenance company (TOE 55–157).

(*k*) Headquarters and headquarters detachment, transportation motor transport battalion (TOE 55–16).

(*l*) Transportation light truck company (TOE 55–17).

(*m*) Transportation medium truck company (TOE 55–18).

(*n*) Transportation heavy truck company (TOE 55–28).

(*o*) Transportation terminal transfer company (TOE 55–118).

(*p*) Transportation medium amphibian company (TOE 55–139).

(*q*) Transportation heavy amphibian company (TOE 55–140).

(*r*) Transportation watercraft teams (TOE 55–530).

(*s*) Military police battalion (TOE 19–55).

(*t*) Engineer utilities team (TOE 5–530).

(*u*) Engineer firefighting team (TOE 5–510).

(*v*) Quality assurance, disbursing and pay team (TOE 14–500).

(*w*) Medical dispensary team (TOE 8–500).

(*x*) Veterinary food inspection detachment (small) (TOE 8–500).

(*y*) Labor service company (TOE 10–449).

(*z*) Signal service team (TOE 11–500).

(*aa*) Army postal unit (TOE 12–605).

(*ab*) Ordnance ammunition team (TOE 9–500).

g. Operating Procedures and Equipment. Details on operation and capacity of terminal operating equipment can be found in FM 55–51, FM 55–52, FM 55–56, FM 55–57, and FM 55–58.

h. Illustrative Example of Water Terminal Capacity Estimation. The following example demonstrates the recommended procedure for water terminal capacity estimation based on the steps and data outlined in the preceding paragraphs.

(1) *Situation.* A true-scale chart (fig. 7–1) of a certain harbor has been prepared for evaluation. With reference to this chart, additional information is assembled in table 7–2.

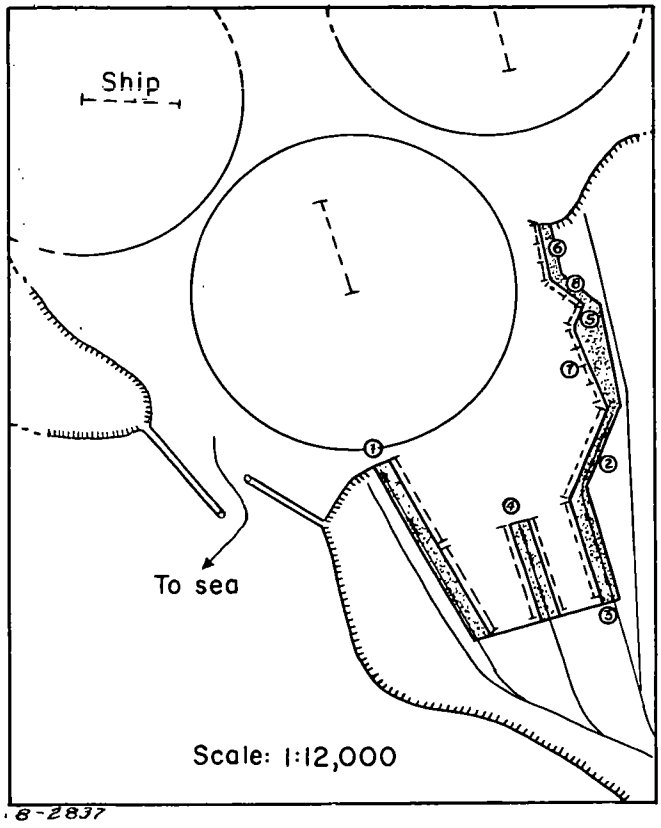

Figure 7-1. Typical harbor (true scale).

Table 7-2. Water Terminal Description

1	1 Wharf number	2 Length (m)	3 Width (m)	4 Minimum depth alongside at low tide (m)
2	1	323	24	10.0
3	2	149	18	10.0
4	3	177	27	10.0
5	4	163	31	10.0 (each side)
6	5	38	17	2.5
7	6	90	18	4.5
8	7	137	23	7.0
9	8	64	18	5.0

(*a*) There is sufficient area inside the harbor to anchor three ships as shown, where they can be worked continuously.

(*b*) In good weather as many as two vessels can be anchored and worked outside the breakwater.

(2) *Problem.* To estimate the daily capacity of this terminal during ideal weather.

(3) *Solution.* (Tables 7-3 and 7-4.)

Table 7-3. Discharge Tonnage at Deep-Draft Wharfage

1	1 Wharf number	2 Vessel that can be berthed	3 Rate of discharge in STON per day
2	1	2 Victorys	2×720=1,440
3	2	1 Victory	1×720= 720
4	3	1 Victory	1×720= 720
5	4	2 Victorys	2×720=1,440
6	Total		4,320

Table 7-4. Discharge Tonnage to Lighterage Wharfs

1	1 Wharf number	2 Lighter berths	3 Rate of discharge in STON per day
2	5	1	1×180= 180
3	6	3	3×180= 540
4	7	4	4×180= 720
5	8	2	2×180= 360
6	Total		1,800

(*a*) *Rate of discharge from ships at anchor to lighters.* From the situation three ships can be anchored inside the breakwater and two can be anchored and worked outside the breakwater in good weather. Therefore, in good weather cargo can be discharged from ships to lighters at the rate of (3+2) ×720=3,600 STON per day.

(*b*) *Resultant daily terminal capacity—summary.*

1. Discharged alongside deep-draft wharfs—4,320 STON per day.

2. Discharged from lighters to wharf—1,800 STON per day.

3. Transferred from ships to lighters—3,600 STON per day.

4. Therefore, 1,800 STON per day is maximum discharge by lighter since lighter wharfage is the limiting factor in this case.

5. Total daily terminal capacity—4,320 STON per day alongside 1,800 STON per day by lighter, for a total of 6,120 STON per day.

(*c*) *Limitations on terminal capacity.* Requirements for dispersion and limitations on the number of ships that can be grouped in one area may restrict the use of the facility to much less than its full capacity.

(4) *Effects of bad weather.* Advance study must be made to determine the probable effect of bad weather on rate of discharge and other factors in water terminal capacity. Continuous records of daily discharge plotted against weather and surf conditions prove valuable in planning future discharge in the same and similar water terminals.

(5) *Operating personnel and equipment.* Appropriate and sufficient operating personnel and equipment must be provided to use the capacities of the physical facilities of the terminal.

7–7. Water Terminals (Beaches)

a. Amphibious Operations.

(1) *Beach capacity.*

(*a*) Each landing in an amphibious operation differs as to climatic and hydrographic conditions and variations in topographic features, as well as in the military situation. These variable factors make it impracticable to develop detailed logistic planning data applicable only to beaches and their capacity to receive troops and cargo. However, certain general planning data can be developed.

(*b*) Beach capacity is the amount of cargo that can be discharged over a given metric beach length within a stated interval of time. During the initial phases of an amphibious operation, beach capacity is limited to the beach (or beaches) over which the assault landing is made; later, if necessary, overall capacity may be increased by the consolidation of beaches for more efficient operation and for the opening of sheltered unloading points in rivers or bays. Experience indicates that, during the *assault* phase of an operation, cargo can be landed and moved across beaches as follows (use either *1* or *2* or *1* and *2* together in proportionate combination):

1. Average STON of cargo per day per kilometer of beach—1,860.

2. Average numbers of vehicles and personnel landed simultaneously per day per kilometer of beach—410 vehicles and 2,930 personnel.

(2) *Requirements for ship unloading.* Facilities for unloading ships offshore are usually limited to the ships' organic gear. Using ships' organic gear, stevedore labor, and lighterage provided by the task force, cargo is discharged at a prescribed rate in planned sequence. The use of balanced amounts of conventional and amphibious ship-to-shore lighterage, combined with planned and controlled ship discharge, reduces beach congestion to a minimum.

(3) *Characteristics of amphibious force vessels and craft* (tables 7–5 through 7–8).

(*a*) Data in this subparagraph with reference to speed and endurance may vary under operational conditions. For the most recent data, consult FM 5–144, FM 55–15, FM 60–30, and SB 700–20.

(*b*) Designating letters and names are used as follows:

1. LC (landing craft) is applied to nonoceangoing vessels of less than 60 meters' overall length designed for landing operations.

2. LS (landing ship) is applied to oceangoing vessels of more than 60 meters' overall length designed for participation in landing operations.

3. LV (landing vehicle) is applied to small equipment designed for landing operations and capable of use on land or water.

(4) *Cargo movement by wheeled amphibians.* In amphibious operations wheeled amphibians

are specialized equipment of exceptional value that enable direct movement of cargo from ships to shore-based dumps or transfer points.

(5) *Equipment required for operations on the beach, for beach clearance, and for operations in shore-based dumps.* World War II experience consistently shows a lack of sufficient shore-based equipment to receive cargo as rapidly as unloading from ships could be accomplished. Resulting bottlenecks at beaches and at beach dumps could have been avoided had additional cargo-handling equipment, particularly cranes, been available. It was found that cargo-handling equipment best adapted to beach and shore-dump employment included cranes, tractors, and trucks. Detailed characteristics of these items are outlined below.

(*a*) Cranes should be self-propelled, of medium and heavy types, with booms 40 feet in length to permit lifting filled cargo nets. Each crane can handle discharge from 3 LCU, 8 LCM, or 12 LCVP under normal beach operations when sufficient trucks or tractors are available to haul or drag away unloaded cargo.

(*b*) Medium and heavy tractors can tow up to nine loaded sled pallets. This type of movement from beach to dump is slow and less satisfactory than movement by truck. However, for dragging pallets from landing craft and within supply dumps, tractors are effective. Tractors are invaluable for clearing the beach and dump areas of mired vehicles. From eight to 10 tractors per assault division, with six or seven on beaches and two or three in supply dumps, are usually sufficient. Several tractors assigned to a beach should be equipped with angledozers.

(*c*) Paragraphs 7–10 through 7–13 are applicable to trucks.

(6) *Beach service troop requirements.* Service troops are employed throughout the supply service cycle from ship unloading to segregation and storage of supplies in shore-based dumps. The multiple functions performed in this cycle require that care be exercised in balancing the type of troops employed, because a breakdown in service troops' functioning will render available equipment partially or completely ineffective.

b. Logistics-Over-the-Shore Operations.

(1) *General.* A logistics-over-the-shore operation (LOTS) provides, in situations other than amphibious operations, for the movement of cargo across the shore between ocean transportation and shoreside facilities. Beaches and other more difficult shoreline are used during this type of operation to the extent required by the situation.

(2) *Beach capacity estimation.* The checklist in paragraph 7–6*b*(2) may be used in determining the beach capacity. Certain of these factors are not primary considerations, and others must be expanded according to the location under study, which determines the weight to be given each individual factor. The following items must be investigated thoroughly to determine their effect on the operation:

(*a*) Weather—wind, fog rainfall, temperature.

(*b*) Sea area—extent, depth of water, type of bottom, vulnerability to sea-wave action.

(*c*) Beach approaches—reefs, bars, man-made obstacles, tide, type of bottom, surf conditions, underwater gradient.

(*d*) Beach—gradient, composition, length, width, wave effect, exits.

(*e*) Hinterland—depth, concealment, transportation net capability.

(3) *Operating equipment.* The same materials-handling functions as those in a conventional port situation are performed, but there is a greater requirement for cranes and forklift trucks that can traverse sand and soft terrain. Amphibians should be used to relieve congestion at the water's edge and eliminate unnecessary handling of cargo.

7–8. Inland Terminals

a. Definition. Inland terminals are those inland transit points where cargo is—

(1) Temporarily held intransit awaiting disposition instructions.

(2) Transferred from one means of transportation to another.

(3) Broken down from bulk shipments and reshipped in small units.

(4) Collected from other points to make a transportation unit for reshipment.

b. Capacity Estimation. Inland terminal capacity is the total tonnage that can be *received*, *processed*, and *cleared* through the terminal in

Table 7–5. Characteristics of Small Landing Craft

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Line item number	Name	Symbol	Length	Beam	Capacity		Draft (loaded)		Speed loaded (kmph)	Range (km)	Crew	Weight empty (LTON)	Cargo space dimensions
					Troops (number)	or Cargo (LTON)	Forward	Aft					
2 L36602	Landing craft, mechanized (Mark VI).	LCM(6)	56 ft	14 ft	120	32.0	3 ft	4 ft 8 in.	14.8	206 at 14.8 kmph	4	28	38 ft by 9 ft 6 in. by 6 ft 4 in.
3 L36739	Landing craft, mechanized (Mark VIII).	LCM(8)	73 ft 6 in.	21 ft	200	53.5	3 ft	5 ft	18.5	457	6	60	37 ft 8 in. by 14 ft 5 in. by 3 ft 8 in.
4 L36876	Landing craft, utility (1466 class).	LCU	115 ft 1 in.	34 ft	300	135.0	3 ft 1 in.	4 ft	13.0	1,120	12	180	52 ft by 29 ft 6 in. by 4 ft 6 in. 22 ft by 14 ft 4 in. by 4 ft 6 in.
5 L36945	Landing craft, vehicle, personnel.	LCVP	36 ft	10 ft	36	3.5	2 ft 2 in.	3 ft	19.5	217	4	8	17 ft 3 in. by 7 ft 5 in. by 5 ft.

Table 7–6. Characteristics of Amphibious Vehicles

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Line item number	Name	Symbol	Length	Beam	Capacity* Troops or Cargo (number)	Capacity* Troops or Cargo (LTON)	Speed Land (kmph)	Speed Water (kmph)	Range Land (km)	Range Water (km)	Crew	Weight empty (LTON)	Example of material carried
2 D10990	Carrier, cargo, full-tracked, amphibious.	M116	15 ft 7 in.	6 ft 10 in.	13	1. 34	59. 5	7. 4	482	35. 4	1	3. 52	14 passengers (including crew).
3 L37030	Landing vehicle, tracked, engineer, model 1.	LVTE–1	39 ft 9¼ in.	12 ft 8½ in.	----------	----------	40. 0	10. 0	640	128. 1	7	36. 90	None.
4 L37118	Landing vehicle, tracked (Mark V).	LVTP–5	29 ft 8 in.	11 ft 8½ in.	34 (land) 25 (water)	8. 05 (land) 5. 35 (water)	48. 2	12. 9	306	91. 7	3	31. 20	105-mm howitzer with crew and 100 rounds of ammunition.
5 L37132	Landing vehicle, tracked, recovery, model 1.	LVTR–1	31 ft 9 in.	11 ft 8½ in.	----------	----------	48. 2	12. 6	306	105. 6	3	33. 50	600 cu ft available with recovery equipment removed from cargo compartment.
6 ----------	Landing vehicle, tracked.	LVT(A)–5	27 ft 2½ in.	10 ft 10 in.	----------	----------	32. 2	10. 4	241	92. 7	5	15. 70	None.
7 ----------	Landing vehicle, tracked (Mark XI).	LVTH–6	21 ft 8 in.	11 ft 8½ in.	----------	----------	44. 7	11. 3	201	83. 4	5	37. 80	None.
8 ----------	Landing vehicle, tracked (Mark VI).	LVTP–6	21 ft 7 in.	10 ft 9 in.	20	----------	48. 2	10. 2	201	83. 4	3	17. 90	Bulk cargo.
9 L67234	Lighter, amphibious, wheeled (LARC–5).	LARC–5	35 ft	10 ft	0 (20)	4. 40 (4. 50)	40. 2	18. 5	257	120. 5	2	7. 20	Unitized cargo.
10 L67371	Lighter, amphibious, wheeled (LARC–15).	LARC–15	45 ft	12 ft 6 in.	0 (50)	13. 40	32. 2	18. 0	121	51. 9	2	19. 00	1 loaded 2½-ton truck or 10 palletized units.
11 L67508	Lighter, amphibious, wheeled (LARC–60).	LARC–60	62 ft 6¾ in.	26 ft 7 in.	125 (200)	53. 60 (89. 30)	22. 5	13. 0	338	194. 6	8	87. 00	Heavy, bulky equipment.

*Figures in parentheses in columns 6 and 7 denote emergency capacity.

Note. No consideration need by given to the draft of amphibious vehicles. However, consideration must he given to the characteristics of the landing area that may affect beaching, such as mud, coral or rock formations.

Table 7-7. Characteristics of Landing Ships

1	1 Name	2 Number of ships in class	3 Type	4 Operational range (nautical Miles)	5 Cargo capacity (LTON)	6 Troop capacity [a]	7 Cargo space (sq ft)	8 Loaded draft: Beaching	9 Loaded draft: Oceangoing	10 Length	11 Boat capacity	12 Typical loads
2	LSD (1)----	26	Flooded well deck.	13, 000	1,233--------	226	17, 316	27 ft (flooded)	18 ft dry	458 ft	2 LCVP and 1 LCPL	3 LCU and 4–5 mdm trk; or 18 LCM (6) and 30 LTON cargo; or 41 LVT; or 27 LCVP; or 44 M48 tk.
3	LSD (28)---	1	Flooded well deck.	13, 000	2,410--------	353	19, 800	30 ft (flooded)	19 ft dry	510 ft	3 LCVP and 1 LCPL	(With two temporary decks with ramps) 92 LVT.
4	LSD (32)---	4	Flooded well deck.	9, 500	2,500 in addition to rated well. deck load.	313	[b] 24, 792	33 ft 9 in. (flooded)	19 ft dry	510 ft 10 in.	3 LCVP and 1 LCPL	3 LCU; or 20 LCM (6); or 9 LCM (8); or 49 LVTP–5; or 87 LVTP–6.
5	LST (1156)--	15	Ramp, 50-ton capacity.	6, 000	Normal—446; Maximum landing—803; Full—1,395	395	14,000 (vehicles), 16,500 (cargo)	4 ft 11 in. fwd 10 ft 8 in. aft	8 ft 3 in. in fwd.	382 ft	3 LCVP and 1 LCPL	80 2½-ton trk, 450 LTON cargo; or 144 ¾-ton trk, 415 LTON cargo; or 233 ¼-ton trk, 530 LTON cargo; or 25 LARC–5, 445 LTON cargo.

6	LST (1153)--	2	Steamdriven; ramp, 50-ton capacity.	7, 700	Normal—446; Maximum landing—803; Full—2,060.	197	14, 340	3 ft 11 in. fwd 11 ft 11 in. aft.	9 ft 6 in. fwd 16 ft 3 in. aft.	382 ft	4 LCVP or 4 LCPR	21 LVT and 35 2½-ton trk; or 25 LARC–5; or 226,000 gal gasoline and 70,000 gal diesel fuel.
7	LST (542)---	148	Ramp, 50-ton capacity.	7, 706	Normal—446; Maximum beaching—803; Full—1,212	141	4,556 (vehicles); 9,772 (cargo)	5 ft 3 in. fwd 10 ft aft.	7 ft. 2 in. fwd 13 ft aft	328 ft	4 LCVP or 4 LCPR	26 2½-ton trk, 650 LTON cargo; or 45 ¾-ton trk, 675 LTON cargo; or 75 ¼-ton trk, 710 LTON cargo; or 23 LARC–5.
8	LST (1171)--	8	Ramp, 75-ton capacity (equipped with turntable).	6, 048	Normal—500; Maximum landing— 900; Full—1,850.	634	18, 313	4 ft fwd 13 ft aft.	9 ft 9 in. 16 ft aft.	442 ft	3 LCVP and 1 LCPL	19 LVTP–5 and CH–19 hel; or 27 LVTP–6 and 5 CH–19 hel; or 69 2½-ton trk; or 42 2½-ton trk with 1½-ton tlr; or 42 M48 tk.
9	LSM-------	136	Ramp, open well.	10, 000	Landing—147; Full—446.	56	2, 900	3 ft 6 in. fwd 7 ft 1 in. aft.	6 ft 4½ in. fwd 8 ft 5 in. aft.	204 ft	----------	3 M48 tanks; or 5 LVT.

[a]Troop capacity may be increased by berthing troops on decks. Troops must provide own feeding facilities.

[b]Add 6,336 sq ft with mezzanine deck installed.

Note 1. A boat space is the space weight allowed one soldier with his individual combat equipment. It is 224 lb or 13.5 cu ft. When computing boat spaces required for cargo, use either the weight or the space occupied, whichever is greater. Hand carts, loaded or empty, require two boat spaces.

Note 2. Running time may be computed from the formula $T=\frac{3D}{S}$ when D=distance run in hundreds of yards.
S=speed in knots (1⅛ mph).
T=running time in minutes.

Table 7-8. Characteristics of Transport-Type Vessels

	1	2	3	4	5	6	7	8	9	10	11
1	Name	Number ships in class	Class	Type	Length	Loaded draft	Troop capacity	Cargo capacity (LTON)	Cargo space	Boat capacity	Cruising range (nautical miles)
2	Amphibious force flagship (AGC).	16	----------	C-2	459 ft--	24 ft----------				2 LCVP 4 LCPL 2 LCPR	30, 000
3	Attack transport (APA 117).	57	Haskell----------		455 ft--	24 ft---	1, 565	446. 0	13,000 sq ft--------- 110,000 cu ft--------	2 LCM(6) 22 LCVP 1 LCPL 1 LCPR	9, 000
4	Attack transport (APA 33).	6	Bayfield----------		492 ft--	27 ft---	1, 647	446. 0	15,000 sq ft--------- 160,000 cu ft--------	4 LCM(6) 18 LCVP 3 LCPL 2 LCPR	11, 630
5	Attack cargo ship (AKA).	35	Montague--	C-2A	459 ft--	24 ft---	212	1335. 0-1600. 0	31,858 sq ft--------- 291,706 cu ft--------	6 LCM(6) 14 LCVP 1 LCPL 1 LCPR	12, 000
6	High-speed transport (APD).	21	----------	EX-DDE	306 ft--	13 ft---	156	45. 0	3,730 cu ft----------	2 LCM(3) 2 LCVP 2 LCPR or 2 LCPL	5, 100
7	Transport submarine (A-SSP).	2	Sea Lion----------		312 ft----------		85	26. 7	----------	20 rubber landing craft.	--------
8	Roll-on/roll-off vehicle ship (T-AK).	1	Comet-----	C-4	449 ft--	22 ft----------		4000. 0 (375 veh)	60,000 sq ft parking space and 176,500 cu ft cargo space.	----------	13, 000
9	Amphibious assault ship (LPH).	13	----------	EX-CVE	88 ft---	28 ft 9¼ in.	1, 500	----------			16, 000

any 1 day. The terminal capacity is estimated by analyzing three major factors—reception capacity, loading and unloading or transfer capacity, and clearance capacity—to ascertain which is the limiting factor and determining the capacity as expressed in daily tonnage. The following is a checklist for estimation of inland terminal capacity:

Collect these data when applicable	*Compute these factors*	*Determine this figure*
1. Channel depths	(1) Evaluate to determine inland terminal reception capacity.	Inland terminal capacity.
2. Obstructions		
3. Capacity of rail facilities		
4. Capacity of highway facilities		
5. Capacity of pipeline facilities		
6. Capacity of air facilities		
7. Enemy air activity		
8. Enemy surface activity		
9. Climate		
10. Weather		
11. Contaminated areas		
12. Our own capabilities in combating obstacles		
1. Tactical dispersion requirements	(2) Evaluate to determine loading and/or unloading or transfer capacity.	
2. Wharf and/or platform facilities		
3. Discharge rates		
4. Unloading rates		
5. Loading rates		
6. Extent of destruction or contamination		
7. Climate and seasons		
8. Weather and tide characteristics		
9. Materials-handling equipment available		
10. Cargo-handling equipment available		
11. Floating craft and equipment available		
12. Airfield capabilities		
13. Transit sheds, yards, and areas		
14. Indigenous labor available		
15. Space reserved for local economy		
1. Capacity of rail facilities	(3) Add to determine clearance capacity.	
2. Capacity of highway facilities		
3. Capacity of inland waterway facilities		
4. Capacity of pipeline facilities		
5. Capacity of air facilities		

c. Estimation of Equipment. Equipment requirements are determined by analyzing the projected workload of the inland terminal in relation to the tonnages and types of cargo to be unloaded, loaded, and transferred.

d. Estimation of Personnel Requirements. Personnel requirements are determined by evaluating the mission of the inland terminal in terms of workload, equipment to be manned, and services to be performed. To insure maximum efficiency in terminal operation, a balanced force and supervisory elements must be available. The use of indigenous and prisoner-of-war labor should be considered.

7–9. Air Terminals

a. General. Air terminals provide facilities for loading and unloading aircraft and for intransit handling of personnel and cargo that are moved by aircraft.

b. Responsibilities.

(1) *Air Force.* The Air Force selects, prepares, and operates air terminals, exclusive of airfields or landing areas operated by and for Army aviation units.

(2) *Army.* The Army provides engineer service support to air terminals, to include construction and maintenance other than repairs and utilities.

c. Operations.

(1) *General.* The theater air force provides aerial port squadrons to operate air terminals. Theater army may establish facilities and station personnel at an air terminal in a tenant status to

perform those functions agreed upon by the theater army and theater air commanders.

(2) *Aerial port squadrons.* An aerial port squadron is a cellular-type Air Force organization. The assigned mission determines its use and its strength. These units provide passenger and cargo-handling capabilities, to include manifesting warehousing, loading, unloading, tiedown, preparation for air delivery, and ejection in flight. One aerial port squadron is capable of performing any one of the following tasks:

(*a*) Handling 480 tons of cargo per 8-hour day in an airlanded operation.

(*b*) Rigging for delivery by parachute and loading 280 tons of cargo per 8-hour day when the packing of parachutes is not required.

(*c*) Rigging for delivery by parachute, packing parachutes, and loading 112 tons of cargo per 8-hour day.

(3) *Army quartermaster air delivery companies (TOE 10–407).* These units are stationed at selected air terminals or at Army logistic installations to prepare cargo for parachute or freedrop delivery. For capabilities of this company, see TOE 10–407 and FM 101–10–2.

(4) *Volume.* The volume of cargo and passenger traffic at an Army airfield may require assignment of a unit to perform these operations. Units that may be employed include the quartermaster air delivery company or teams from TOE 10–500 transportation terminal transfer company (TOE 55–118) or the terminal contract supervision detachment and the cargo documentation section from TOE 55–500.

d. Airfield Capabilities.

(1) The following criteria establish the maximum number of aircraft that can be based on an airfield or landing strip. Dispersion requirements may dictate decreased utilization of such facilities.

(*a*) Improved airfields in rear of the combat zone can serve as a base for a maximum of two wings. Under ideal conditions aircraft land or take off at 3-minute intervals, and 1 hour on the ground is required for each landing for necessary servicing, reloading, and inspection.

(*b*) Unimproved airfields and landing strips in rear of the combat zone can serve as a base for approximately one wing.

(*c*) Transport aircraft normally are not based in the combat zone. On airfields in the combat zone aircraft land or take off at 3-minute intervals under ideal conditions, and the time required on the ground is reduced to 30 minutes. Service and maintenance are limited to emergency requirements only, and the tactical situation normally does not permit more time than that required for actual unloading and reloading.

(2) For transport aircraft use, airfields in rear of the combat zone should be operational day and night. Airfields in the combat zone may be operational only during daylight hours, depending on the enemy air capabilities.

(3) The capabilities of aerial port squadrons also influence traffic potential of airfields.

Section III. MOTOR TRANSPORT

7–10. Motor Transport Operations

a. Motor transport operations in support of forces in a theater of operations are generally either local or line hauls.

(1) *Local hauls.* Local hauls are characterized by low running time in relation to loading and unloading time. These hauls normally involve a number of trips per day and are evaluated on the basis of tons moved during the operational period. The method of operation predominantly used in local hauls is the shuttle, or a series of round trips made by the same vehicles between two specified points. Port and beach clearance, installation support operations, transfer operations, and field support operations are all readily adaptable to local haul.

(2) *Line hauls.* Line hauls are characterized by high running time in relation to loading and unloading. These hauls normally involve one trip or a portion of a trip per day. The most common method of operation used in line haul is the relay—transporting supplies or troops in continuous movement without transfer of load. This is accomplished by a change of truck-tractors or drivers. Intersectional motor transport service requirements are generally accomplished with line haul.

b. Other terms used in conjunction with motor transport operations are—

(1) Direct haul.

(2) Piggyback (or trailer or flatcar (TOFC)).

(3) Roll-on/roll-off.

(4) Highway movement.

(5) Off-road movement.

(6) Highway regulation (planning, scheduling, routing, and directing the actual use of a military road maneuver network by vehicular and foot traffic).

c. See FM 55-35 for details on motor transport service in theaters of operations.

7-11. Planning Factors

a. Because of the varied services performed, the different loads carried, the different terrain over which motor transport operations are conducted, planning factors should be used with caution and applied only in the absence of specific data on the local situation. (For classified motor transport planning factors, see FM 101-10-3, ch 5.)

b. The following factors are used in motor transport planning for computing truck and truck company requirements in the absence of specific data:

(1) Vehicle availability—the average number of task vehicles not in maintenance and therefore available for daily operations out of the total task vehicles assigned to a truck unit.

(*a*) Operational short range—83 percent.

(*b*) Long-range planning—75 percent.

(2) Vehicle payload—the anticipated payload per vehicle (table 7-9). The following are rules of thumb only:

(*a*) Off-road—rated capacity of vehicle.

(*b*) Highway—rated capacity plus 50 percent for trailers or semitrailers and 100 percent for tactical wheeled vehicles.

(3) Trips per day—the daily round trips that a vehicle averages. These vary with running time and loading and unloading time. The following are general averages only:

(*a*) Line haul—two per day.

(*b*) Local hauls—four per day.

(4) Length of haul—the one-way distance cargo is to be hauled, from which round-trip distance may be computed. The following are rules of thumb only:

(*a*) Line haul—160 kilometers one way.

(*b*) Local haul—25 kilometers one way.

(5) Rate of movement—the average number of kilometers covered in an hour, including halts during the period of movement. For long-range planning, the following estimates may be used:

(*a*) Poor roads—16 kilometers in the hour.

(*b*) Good roads—25 kilometers in the hour

(6) Turnaround time—the time consumed in loading, unloading, and moving from origin to destination and return to origin.

(7) Loading and unloading time—time consumed per turnaround in loading and unloading areas, including time waiting, spotting, documenting, and handling of cargo on and off vehicles. The following are loading and unloading times for loose cargo:

(*a*) Straight trucks—2.5 hours per round trip.

(*b*) Semitrailers in relay operation—1 hour per relay; 2.5 hours' loading and unloading time per round trip.

(*c*) Truck-tractors in relay operations—1 hour per relay.

(8) Operational day—the number of hours per day in which vehicles with drivers are normally employed.

(*a*) One shift (peacetime)—10 hours.

(*b*) Round-the-clock (wartime)—20 hours.

(9) Unit lift and daily lift—unit lift is the amount of cargo a truck unit is expected to move at one time; daily lift is that which the unit can move in a day with a number of trips (table 7-10).

(10) Ton-kilometers and passenger-kilometers—the product of the number of tons or passengers and the actual distance they were moved.

c. Table 7-9 gives vehicle payload capacities. Passenger capacity is based on an allowance of 18 inches per man, excluding driver and assistant driver. No allowance is made for individual field equipment for automobiles and ambulances. Passengers are not carried in semitrailers and dump trucks except in emergencies. Types of semitrailers not generally used in off-road operations are refrigerator, 12-ton van, tank transporter, and gasoline.

Table 7-9. Vehicle Payload Capacities for General Planning

1	2	2	3	4	5	6	7	8	9
Item	Line item number	Nomenclature	Off road (tons)	Highway average (tons)	Highway maximum (tons)	Towing capacity (tons)		Passengers	Cargo space
						Highway	Cross country		
2	B04441	Automobile, sedan, lt						4	
3	C39696	Bus, 37-passenger						37 or (18 liters)	
4	D12086	Carrier, pers, full-tracked, armd						11	
5	S70106	Stlr, low-bed, 12-ton, 25-ft	12	16	18				200 sq ft.
6	S70380	Stlr, low-bed, 15-ton, 4-wheel	25	16	25				320 sq ft.
7	S70517	Stlr, low-bed, 25-ton, 4-wheel	25	25	30				
8	S70791	Stlr, low-bed, 60-ton, 8-wheel	60	60	60				204 sq ft.
9	S71613	Stlr, reefer, 7½-ton, 2-wheel	6	6	7½				790 cu ft.
10	S71887	Stlr, stake, 6-ton, 2-wheel	6	9	9			24	1,130 cu ft.
11	S72024	Stlr, stake, 12-ton, 4-wheel	17.2	25.2	25.2				2,100 cu ft.
12	S72161	Stlr, stake, 20-ton, 34-ft	20	18	24			65	1,400 cu ft.
13	S72846	Stlr, tk, gas, 5,000-gal, 4-wheel	3,000 gal	5,000 gal	5,000 gal				
14	S73394	Stlr, tk transporter, 50-ton, 8-wheel	50	40	50				
15	S73805	Stlr, van, cgo, 6-ton, 2-wheel	6	9	9			24	1,020 cu ft.
16	S73942	Stlr, van, 20-ton, 34-ft	20	18	24			65	1,349 cu ft.
17	S75038	Stlr, van, shop, 6-ton, 2-wheel	6	8	8				1,675 cu ft.
18	S75175	Stlr, van, 12-ton, 4-wheel	12	18	18			50	1, 342 cu ft.
19	W95537	Tlr, cgo, ¾-ton, 2-wheel	¾	1⅛	1⅛				175 cu ft.
20	X38639	Trk, amb, frontline, ¼-ton, 4X4						4 (or 3 litters)	
21	X38776	Trk, amb, ¾-ton, 4X4						8 (or 5 litters)	
22	X39735	Trk, cgo, ¾-ton, 4X4	¾	1	1½	2		8	160 cu ft.
23	X40009	Trk, cgo, 2½-ton, 6X6	2½	4	5	5	3	20	408 cu ft.
24	X40381	Trk, cgo, 5-ton, 6X6 (single tires)	5	6	7½	15	7½	20	513 cu ft.
25	X41105	Trk, cgo, 5-ton, 6X6 (dual tires)	5	6	10	15	7½	20	513 cu ft.
26	X41790	Trk, cgo, 10-ton, 6X6	10	10	15	25	15		496 cu ft.
27	X43297	Trk, dump, 2½-ton, 6X6	2½	4	5	5	3	20	67.5 sq ft.
28	X43845	Trk, dump, 5-ton, 6X6	5	7½	7½	15	7½	15	135 cu ft.
29	X57271	Trk, tk, gas, 2½-ton, 6X6	2½	2½	2½				
30	X58367	Trk, tk, water, 2½-ton, 6X6	1¾	4¼	4¼				
31	X61107	Trk, util, ¼-ton, 4X4	0.4	0.4	0.6	1	¾	4	66 cu ft.
32	X62006	Trk, van, shop, 2½-ton, 6X6	2½	2½	2½	4	3		
33	X62340	Trk, van, shop, 2½-ton, 6X6	2½	3½	3½	4	3		

Table 7-10. Truck Unit Capability Estimates for Long-Range Planning

a. Local Haul—STON Per Day (Highway)

(Vehicle availability X average tons per vehicle X trips per day.)

	1	2	3
1	Unit	Computation	STON per day
2	Light trk co (2½-ton trk)	45×4×4=	720.
3	Light trk co (5-ton trk)	45×6×4=	1,080.
4	Medium trk co (stlr)	45×12×4=	2,160.
5	Medium trk co (petrl) (stlr)	45×5,000×4=	900,000 gal per day.
6	Medium trk co (reefer, 7½-ton)	45×6×4=	1,080.
7	Heavy trk co (stlr, tank transporter)	18×40×4=	2,880.

b. Line Haul—STON Per Day (Highway)

(Vehicle availability X average tons per trip X trips per day.)

	1	2	3
1	Unit	Computation	STON per day
2	Light trk co (2½-ton trk)	45×4×2=	360.
3	Light trk co (5-ton trk)	45×6×2=	540.
4	Medium trk co (stlr)	45×12×2=	1,080.
5	Medium trk co (ptrl) (stlr)	45×5,000×2=	450,000 gal per day.
6	Medium trk co (reefer, 7½-ton)	45×6×2=	540.
7	Heavy trk co (stlr, tank transporter)	18×40×2=	1,440.

7-12. Computing Truck Unit Requirements

a. The following formulas may be used for motor transport planning:

(1) One-lift hauls. To determine the number of truck companies required to move a given number of tons in one lift, use the following formula:

$$\frac{\text{Tons to be lifted}}{\text{tons per vehicle} \times \text{vehicle availability per company}} = \text{truck companies required.}$$

Example: To determine the number of transportation light truck companies required to move 2,700 STON in one lift

When: 2,700 = tons to be lifted.
4 = tons per truck, 2½-ton, 6x6.
45 = vehicles available per company.

$$\frac{2,700}{4 \times 45} = 15 \text{ transportation light truck companies required.}$$

Note. If the number of vehicles required is desired rather than the number of truck companies, *omit* the vehicle availability factor in the formula.

(2) Sustained haul in one continuous operation. In most operations there is a continuous flow of supplies forward from dumps, depots, beaches, or terminals. In such cases tonnages move forward only, and trucks return for another load. The average turnaround time required by the truck units to complete the round trip must be considered. Turnaround time is computed by dividing the round-trip distance by the rate of movement and adding delays. Thus, turnaround time = $2 \times \frac{\text{distance}}{\text{rate}}$ + delays. The applicable formula for sustained operations becomes:

$$\frac{\text{Daily tonnage forward} \times \text{turnaround time}}{\text{tons per vehicle} \times \text{vehicles available per company} \times \text{operating time per day}} = \text{truck companies required.}$$

Example: To determine the number of transportation medium truck companies equipped with 12-ton cargo semitrailers required to haul 4,800 STON per day 240 kilometers from point A to point B, using the semitrailer relay method of operation, when

Rate=20 kilometers in the hour.
Delay=2 hours per round trip.
The turnaround time becomes—

$$2\times\frac{240}{20}+2+*6=32 \text{ hours.}$$

*Relay time (6 hr) computed as 1 hour required for each relay operation and a relay required at each end of a segment of a relay operation. In the problem the distance (240 kilometers) was divided into 3 equal segments of 80 kilometers. Hence, 3 x 2=6.

To complete the example when

Tons per vehicle=12.
Vehicles available per company =50 (at least two trailers per tractor are assumed).
Operating time per day=20 hours.
The formula becomes:

$$\frac{4{,}800 \times 32}{12 \times 50 \times 20}=12.8 \text{ or } 13 \text{ medium truck companies required.}$$

b. Formulas similar to those in *a* above can be used to compute requirements for troop movements or for hauling bulk liquid by using the number of persons or gallons, respectively, rather than STON.

c. Through study and analysis of intelligence reports or the actual survey of road conditions in an area of operations, the highway planner may develop good reason for assuming that the planning factors as shown may be changed. He should, therefore, be in a position to alter his assumptions, computations, and the resulting requirements.

7–13. Highway Tonnage Capabilities

a. In selecting the routes over which cargo is to be hauled, the planner must consider the capabilities of the roads and bridges to sustain the operation. The gross weight of the heaviest loaded vehicle should not exceed the rated tonnage capacity of the weakest bridge, unless it is determined that such bridge or bridges will be strengthened. It is difficult to determine the exact tonnage capabilities of highways for sustained operations because of the number of varying conditions that prevail. Also, the volume of tactical, administrative, and indigenous traffic to be accommodated on supply routes may exceed the number of cargo-hauling vehicles, which further restricts the capabilities of motor transport.

b. Table 7–11 may be used as a guide in the absence of more accurate data for estimating the supply support tonnage capabilities of highways under varied conditions, assuming that operations are sustained, adequate road maintenance is provided, and each road bears two-way traffic. In using the reduction factors, when more than one limiting feature is involved, apply the narrow roadway factor first; then to the new capability apply one of the next three on terrain; and finally, to the latter adjustment apply the weather factor if the conditions are for a sustained period. All reduction factors are maximum under extreme conditions. FM 55–15 defines the various conditions of roadway, terrain, and weather (colm 5 to 9 in table 7–11) and provides a guide for estimating incremental reductions in highway tonnage capabilities associated with deviations from standard conditions.

c. Planned tonnage movement should not exceed the capability of any portion of the road net to be used, unless reconstruction or heavy maintenance is provided to increase the capability of the section of highway or bridge to meet the demands.

Table 7–11. Highway Tonnage Capabilities

1	1	2	3	4	5	6	7	8	9
		Daily tonnage forward			Reductions applicable to various conditions				
1	Type of highway	Optimum dispatch route only (STON)	Supply traffic communications zone (STON)	Supply traffic combat zone (STON)	Narrow roadway (percentage)	Rolling terrain (percentage)	Hilly terrain with curves (percentage)	Mountainous terrain (percentage)	Seasonal bad weather (percentage)
2	Concrete	60, 000	36, 000	8, 400	25	10	30	60	20
3	Bituminous	45, 000	27, 000	7, 300	25	10	30	60	30
4	Bituminous-treated	30, 000	18, 000	5, 800	25	20	40	65	40
5	Gravel	10, 150	6, 090	3, 400	25	20	50	70	60
6	Dirt	4, 900	2, 940	1, 600	25	25	60	80	90

Otherwise, alternate routes must be selected to distribute the load. If no alternate route is available and the indicated tonnage is not reduced, the highway or bridge can be expected to deteriorate rapidly and disrupt any sustained operation. (It should be kept in mind that maintenance vehicles and personnel on a road may also interfere with the flow of traffic and thereby limit capability.)

Section IV. PIPELINES

7–14. Capacity

The capacities of pipeline systems vary, depending on the size of pipe, gradient, location and size of pumps, and type of construction. Pipelines are capable of multiproduct operation. Welded commercial-type pipelines can be operated at much greater pressures than standard military victaulic-coupled lines. For general planning purposes the pipeline capacities given in table 7–12 for standard military lightweight steel tubing may be used. Gallons per day have been computed at normal design capacity, using an average operating day of 20 hours (average all products). Although military lightweight steel tubing ordinarily forms most of the length of a pipeline, it is normally not buried, nor is it used for submerged stream crossings or in populated areas and locations where hazards of fire and damage are acute. In situations where lightweight tubing is unsuitable, standard-weight, commercial-type (API) line pipe is the selected military standard for use in petroleum pipelines. TM 5–343 contains detailed information and data on pipeline equipment and a discussion of pertinent pipeline planning considerations where deliberate planning estimates are needed.

7–15. Requirements

Estimates of daily petroleum, oil, and lubricant (POL) requirements for a 12-division field army are based on a factor of 7 gallons per man per day. Requirements for this force vary from 3 million to 4 million gallons daily; for an eight-division field army, they vary from 2 million to 3 million gallons per day, depending in each instance on the composition of the force and the tactical situation. However, for forces smaller than a 12-division field army, the 7-gallon-per-man-per-day factor tends to vary. When communications zone (COMMZ) and tactical air force requirements are added to the field army requirements, the estimated total theater average may be increased to 6 million gallons per day to support a 12-division field army and to 4 million gallons per day to support an eight-division field army. The POL system must provide the capacity to receive, store, maintain, distribute, and issue the types and quantities of fuels that these requirements represent. To satisfy this demand, six 8-inch pipelines, or two per corps, are required to support a 12-division force.

Table 7–12. Capacity of Standard Military Lightweight Steel Tubing

	1	2	3	4	5	6	7	8
1	Inside diameter of line (in.)	Nominal tubing size (in.)	Normal design capacity (bbl per hr)	Emergency capacity (bbl per hr)	Safe working pressure (psi)	Maximum working pressure (psi)	Gallons per day	Net STON per day
2	4.35	4	355	393	600	750	298, 000	910
3	6.415	6	785	1, 000	600	750	660, 000	2, 000
4	8.415	8	1, 355	1, 730	500	625	1, 140, 000	3, 480
5	12.481	12	7, 150	11, 400	400	500	6, 000, 000	18, 300

Section V. RAILWAYS

7–16. General

a. Railway construction data are contained in chapter 8.

b. Estimates of railway capacity, operating personnel, equipment, and supply requirements for a specific railway line should reflect consideration of the basic characteristics of the line, the nature of the country in which the operation is planned, and

the purpose for which the planning is being done. The following items are essential to intelligent appraisal. If detailed information on these items is not available, their effects on the operation must be assumed, based on overall information of railroad operations in the country involved.

(1) Length of time.
(2) Condition of roadbed and track.
(3) Gage of track.*
(4) Single, double, or multiple track.
(5) Weight and cross section of rail. (Where mixed rail occurs, a complete inventory of rail and compromise rail joints is desirable.)
(6) Type of ballast and depth.
(7) Type of ties (if wood) treated or untreated.
(8) Tie spacing.
(9) Axle load limitations (track and bridge).
(10) Profile of line showing location and length of ruling grade. (Any helper grade or any momentum grade that is not the ruling grade should show location and description.)
(11) Alinement of line showing location, length of minimum radius curves, and super elevation.
(12) Location and description of bridges and tunnels.
(13) Location, length, and description of passing tracks.
(14) Location, type and quantity of fuel supply.
(15) Location, quantity, and quality of water supply.
(16) Location and capacity of yards.
(17) Location and capacity of—
  (*a*) Car repair tracks and enginehouses.
  (*b*) Heavy repair shops.
(18) Type and availability of motive power.
  (*a*) Weight in working order.
  (*b*) Expected working tractive effort.
  (*c*) Age.
(19) Type and availability of rolling stock.
  (*a*) Capacity and dimension.
  (*b*) Age.
(20) Allowable drawbar pull.
(21) Diagrams showing minimum structure, maximum unrestricted loading, and equipment gages.
(22) Signal system.
(23) Dispatching facilities.
(24) Route junctions.
(25) Availability of new equipment and repair parts.
(26) Indigenous labor resources.
(27) Determination of the attitude and loyalty of local personnel. (Can guerrilla operations be expected?)

c. A military railway operating division will vary from approximately 150 to 250 kilometers, depending on existing conditions. For general planning purposes, however, an average of 150 kilometers per railway division may be assumed.

7–17. Evaluation and Planning

Paragraphs 7–18 through 7–26 are designed primarily for wartime estimates of railway operations in a theater of operations. Analytical refinements and elaborate train density studies are difficult to justify and have been avoided because of the lack of basic information and the relative uncertainty inherent in military operations. The planner should also bear in mind that in the early stages of a war indigenous equipment and labor may be used to a large extent, which again may vary the expected tonnage capacity. A more detailed estimate may be made using those methods and factors contained in FM 55–21.

7–18. Train Density

Train density is the number of trains per day that can be operated in each direction over a railway line. Work trains are not included in train density. Train densities vary, depending on the condition of track; location, length, and type of passing siding; adequacy of terminal facilities; and availability of motive power and rolling stock. Densities recommended below are averages based on experience under theater of operation conditions. After air superiority has been attained and the intensity of combat has been reduced, depending on judgment of operating conditions, densities, achieved may be expected to exceed by 20 percent those presented below. (Planning capacities are discussed in para 7–4.)

*Track gages vary widely, starting at 0.60 m (23⅝ in.) and going to 1.676 m (66 in.). The most widely used gages are—

Broad	*Narrow*	*Standard*
1.676 m (66 in.)	1.067 m (42 in.)	----------
1.60 m (63 in.)	1.00 m (39⅜ in.)	1.435 m (56½ in.)
1.524 m (60 in.)	0.914 m (36 in.)	----------

Single-track lines [1]---10 trains per day in each direction.

Double-track lines----30 trains per day in each direction.

Multiple-track lines--The extra tracks will be used to rehabilitate and maintain two tracks in operation under most theater of operation condition.

7-19. Net Trainload

The net trainload, or payload, carried by trains on different divisions of the same line may vary greatly, depending on the conditions of operation. Experience indicates that, under normal theater of operation conditions over standard gage railways, a single-engine net trainload of 400 STON may be used as an *average* for planning purposes; on narrow gage railways a single-engine net trainload of 300 STON may be used.

7-20. Net Division Tonnage

a. Net division tonnage is the net tonnage (STON) or payload that can be moved over a railway division each day.

Formula:

Train density × average net trainload = net division tonnage.

b. Troop, hospital, or other special trains will replace an equal number of tonnage trains; and, when operation of such trains is anticipated, the factor for train density must be so adjusted with the resulting decrease in net division tonnage.

7-21. Equipment Estimation

Planning data included herein are based on use of standard U.S. Transportation Corps equipment. Allowances for use of indigenous or captured equipment should be based on judgment after evaluation of the many factors involved, such as availability of equipment, extent of expected destruction, condition of equipment, types and local availability of fuel, availability of repair parts, types of coupling devices, etc. Planning data are available in FM 55-15, TM 55-206, logistic surveys, special transportation studies based on intelligence reports, reports of governments or railroads in peacetime, and from articles appearing in such publication as *Railway Gazette* (British) and *Railway Age* (U.S.).

a. Road Engines. The following data are recommended for general planning purposes. Computation of requirements should be made for each division separately.

(1) Average rate of travel from division terminal to division terminal—13 kilometers per hour.

(2) Time in each division terminal for steam locomotives—8 hours.[2]

(3) Time in each division terminal for diesel-electric locomotives—3 hours.[2]

(4) Reserve engines, to allow for unforeseen circumstances, such as operational peaks, heavy repairs, or destruction—20 percent.

Formula:

$$TD \times \frac{RT+TT}{24} \times 2 \times RF = \frac{TD}{10} \times (RF+TT)$$

=number required for division, when

TD=train density one way.

RT=average running time in hours.

TT=terminal time at one end of the division.

24=number of hours in a day.

RF=operational reserve factor=1.2.

b. Switch Engines.

(1) Switch-engine requirements at water and inland terminals and division terminals are dependent on the physical track layout and the number of cars to be handled at such points. The following may be used as a general guide only:

(*a*) For water and inland terminals one per 67 cars dispatched or received per day.

(*b*) For division terminals one per 100 cars passing per day.

(2) Requirements as computed above should by increased by 20 percent to allow for unforeseen circumstances, repairs, etc.

c. Rolling Stock.

(1) *Freight.*

(*a*) Requirements are computed separately for operations between major supply installations or areas on each line of communications as follows:

$$\frac{\text{Daily tonnage}}{\text{average tons per car}} \times \text{turnaround time} = \text{number of cars.}$$

[1] Passing truck intervals of 10-15 kilometers.

[2] Allows time for locomotive servicing, running repairs, and time lost between enginehouses and yards.

Turnaround time is the total estimated number of days required for a car from the time it is placed for loading at its point of origin, moved to its destination, unloaded, and returned to its point of origin. Such time may be computed as follows: allow 2 days at origin, 1 day at destination, and 2 days' transit time for each division (or major portion thereof) that the cars must traverse. This method, rather than an actual hour basis, is used to incorporate delays due to terminal and way-station switching as well as intransit rehandling of trains.

(*b*) Computations should be increased by 10 percent to meet operational peaks, commitments for certain classes of cars, and bad order cars.

(*c*) An average planning factor for net load per car may be assumed as follows:

Standard gage to broad gage	
U.S. equipment	20 tons
Foreign equipment	10 tons
Narrow gage	
U.S. equipment	15 tons
Foreign equipment	7½ tons

(*d*) Tank car requirements are computed separately, based on the bulk POL requirement and the computed turnaround time.

(2) *Passenger.*

(*a*) Passenger car requirements vary, depending on troop movement policies, evacuation policies, and rest and recuperation policies.

(*b*) Theater passenger car requirements are normally fulfilled by acquisition of local equipment, with the exception of hospital cars or trains.

7–22. Characteristics of U.S. Rolling Stock

Table 7–13 contains the characteristics of U.S. rolling stock.

7–23. Outsize Equipment

Outsize equipment is that equipment which, because of extreme dimensions (height, width, length) or extreme weight, or combinations of the foregoing, requires special handling under restricted speeds and/or on special cars. The planner should recognize the fact that more and more of this type of equipment is being designed and should attempt to build a train of these outsize loads for a single movement rather than assume a few in each train moving on the line of communications. Such movements require special meeting points on adjacent lines of a double-track line of communications and will retard traffic returning to its point of origin as well as following trains in the same direction.

7–24. Personnel Requirements

The basic unit of railway organization in a theater of operations is the transportation railway battalion. This battalion operates and maintains a division of railway that is similar to U.S. commercial railroad organization. Military organizations of administrative and operating personnel are designed to fulfill the operating personnel needs of the basic units (railway divisions) and the administrative personnel needs of the several divisions comprising a railway system. Personnel requirements are therefore estimated by division.

7–25. Supervisory, Operating, and Maintenance Organizations

a. Supervisory. The following organizations are supervisory:

(1) Headquarters and headquarters company, transportation railway brigade (TOE 55–201). Commands and supervises transportation railway groups in a large landmass theater.

(2) Headquarters and headquarters company, transportation railway group (TOE 55–202). Normal requirements are one per two to six transportation railway battalions and one or two transportation railway shop battalions.

b. Operating (*transportation railway battalion* (*TOE 55–225*)).

(1) Requirements are estimated on the basis of the number of traincrews required. The 40 traincrews provided in the operating company of the battalion are the controlling factor. When augmentation is necessary, additional crews are provided from TOE 55–500. This augmentation does not upset the equilibrium of the battalion for carrying out its assigned function, provided the normal length of line to be operated is not exceeded or motive power added exceeding the capabilities of the equipment maintenance company. Normally, one transportation railway battalion is assigned to a railway division (usually 145–242 kilometers of main track).

Table 7–13. Characteristics of U.S. Rolling Stock

1	1 Type of car	2 Gage	3 Capacity: Cargo space	4 Capacity: Tons	5 Tare weight (empty tons)	6 Inside dimensions: Length	7 Inside dimensions: Width	8 Inside dimensions: Height
	Foreign service							
2	Box (30-ton)	Narrow	1,588 cu ft	30	13. 6	34 ft 5½ in.	7 ft ¾ in.	6 ft 4 in.
3	Box (40-ton)	Std to broad	2,520 cu ft	40	18. 5	40 ft 6 in.	8 ft 6 in.	6 ft 5⅝ in.
4	Flat (30-ton)	Narrow	247 sq ft	30	10. 9	34 ft 5⅞ in.	7 ft 2 in.	
5	Flat (40-ton)	Std to broad	351 sq ft	40	14. 5	40 ft 9 in.	8 ft 7¼ in.	
6	Flat (80-ton)	Std to broad	447 sq ft	80	33. 3	46 ft 4 in.	9 ft 8 in.	
7	Flat, depressed center (70-ton)	Std to broad	193 sq ft	70	41. 5	50 ft 7 in.	9 ft 8 in.	
8	Gondola, high-side (30-ton)	Narrow	946 cu ft	30	13. 0	34 ft 5 in.	6 ft 10½ in.	4 ft.
9	Gondola, high-side (40-ton)	Std to broad	1,680 cu ft	40	18. 0	40 ft.	8 ft 8¾ in.	4 ft.
10	Gondola, low-side (30-ton)	Narrow	356 cu ft	30	12. 1	34 ft 6 in.	6 ft 10½ in.	1 ft 6 in.
11	Gondola, low-side (40-ton)	Std to broad	500 cu ft	40	16. 0	40 ft 4½ in.	8 ft 3¼ in.	1 ft 6 in.
12	Tank, POL (6,000-gal)	Narrow	6,000 gal	20	16. 0			
13	Tank, POL (10,000-gal)	Std to broad	10,000 gal	35	19. 0			
	Domestic service							
14	Box (50-ton)	Std	3,975 cu ft	50	23. 0	40 ft 6 in.	9 ft 2 in.	11 ft.
15	Flat (50-ton)	Std	454 sq ft	50	25. 5	43 ft 3 in.	10 ft 6 in.	
16	Flat (70-ton)	Std	513 sq ft	70	27. 0	49 ft 11 in.	10 ft 3 in.	
17	Flat (100-ton)	Std	562 sq ft	100	35. 0	54 ft	10 ft 6¼ in.	
18	Gondola, high-side (50-ton)	Std	1,770 cu ft	50	25. 0	41 ft 6 in.	9 ft 6 in.	4 ft 6 in.
19	Gondola, low-side (50-ton)	Std	1,184 cu ft	50	23. 0	41 ft 6 in.	9 ft 6 in.	3 ft.
20	Tank, POL (10,000)	Std	10,000 gal	35	23. 0			

Note. Average payload for each type of car, except tank cars, is 50 percent.

(2) In estimating traincrew requirements, the following basis may be used:

(*a*) For road operations. One crew per train per day (moving in either direction) per division.

(*b*) For switching. Two crews per switching engine in operation. (For general planning purposes reserve switch engines are not considered.)

(*c*) For road operations and switching. Assume 80-percent availability of assigned crews to allow for sickness and other absences.

c. Maintenance.

(1) *Transportation diesel-electric locomotive repair company (TOE 55–247).* This unit performs general support maintenance on diesel-electric locomotives and locomotive cranes. Capabilities include general support maintenance on 25 diesel-electric locomotives and/or locomotive cranes per month.

(2) *Transportation railway car repair company (TOE 55–248).* This unit performs general support maintenance on railway cars. General support capabilities include maintenance of 600 railway cars per month. This unit also has a supply mission. It receives, stores, and issues 8,000 line items or railway supplies and repair parts per month in support of four to six transportation railway battalions.

(3) *Railway workshop, mobile (TOE 55–500).* The railway workshop, mobile, may be required to provide back shop support in the initial phase of rail operations before the arrival of the railway battalion, to perform repairs in forward areas to restore war-damaged equipment, or to augment a railway battalion in lieu of an additional shop battalion.

7–26. Supply

a. Fuel and Lubricants. Fuel and lubricants are discussed in paragraphs 5–6 through 5–8.

b. Repair Parts. Estimated repair parts requirements for motive power and rolling stock are 1.5 STON per month for each train per day (moving in either direction) over each division.

Section VI. MOVEMENT OF TROOP UNITS BY RAIL

7–27. Space Requirements for Troop Loading on U.S. Equipment (CONUS Only)

a. Capacities of standard U.S. passenger cars are given in table 7–14.

Table 7–14. Capacities of Standard U.S. Passenger Cars

	1	2	3	4
1	Dimensions and capacity	Day coach	Tourist sleeper	Standard sleeper
2	Length in feet	65–75	65–75	65–80
3	Number of sections	None	13–16	12–16
	Maximum seating:			
4	2 men to each double seat.	60–70	52–64	53–64
5	3 men to each 2 double seats.	45–52	39–48	40–48
	Sleeping capacity:			
6	2 men per berth (maximum).	None	52–64	53–64
7	3 men per section	None	39–48	36–48
8	1 man per berth	None	26–32	27–32

b. For planning purposes and staff training the following assumptions may be used:

(1) Coaches, average—54 troops with individual equipment.

(2) Sleeping cars, average—27 troops with individual equipment.

(2) Sleeping cars, average—27 troops in a standard pullman.

c. A typical passenger train for long-distance moves consists of seven day coaches, 14 sleeping cars, two kitchen cars, two diner cars, and one or two baggage cars. Mixed trains, which carry both personnel and freight (vehicles, artillery, and equipment), are authorized only for reasons of military necessity. They are, at times, desirable from a tactical and organizational standpoint. Such moves are not economical when passenger equipment is in short supply, because mixed trains move at freight speed and equipment is not fully used.

7–28. Kitchen, Diner, and Baggage Cars

In assembling a passenger train, kitchen, diner, and baggage cars are assigned on the basis of one per 250 men or fraction thereof.

7–29. Loading of Equipment and Supplies

a. The amount of headquarters, kitchen, and maintenance equipment varies somewhat in all units. For planning purposes allow 20 STON per company or equivalent unit.

b. For company or larger unit movements CONEX containers should be used wherever practicable for consolidation and security or organizational equipment and baggage allowance less hand baggage.

c. The rated weight capacity of a car does not mean that the car can carry the rated tonnage of all items. For many types of cargo the cubic capacity of the car is reached ahead of the rated tonnage. Such low-density items include class I supplies, clothing and blankets, tentage, and motor vehicle parts.

d. In loading high-density items the rated tonnage of the car will be reached before the cubic capacity is met. Examples of high-density items are ammunition, barbed wire, corrugated iron, cement, rifles in chests, telephone wire, and engineer tools.

7–30. Flatcar Requirements

a. Flatcar requirements (table 7–15) are based on maximum utilization of each car. The following flatcars should be used for planning purposes:

40.0-foot	50-ton
46.0-foot	50-ton
50.5-foot	50-ton
56.0-foot	200-ton

Computation should not be restricted to cars of one length. One to two feet per car is normally an adequate allowance for vehicle tiedowns and bracing.

b. Maintenance of unit integrity requires 10 percent additional flatcars over those required for separate loading. Freight trains moving heavy equipment, such as tanks, artillery, vehicles, and engineer equipment, seldom exceed 65 cars or 1,200 tons.

7–31. Airborne, Armored, Infantry, and Infantry (Mechanized) Division Rail Moves

Tables 7–16 through 7–20 show the approximate amount of rail equipment needed to move the personnel and authorized vehicles, equipment, weapons, and supplies for airborne, armored, infantry, and infantry (mechanized) divisions. (Data have not yet been developed for the airmobile division.) Assumptions contained in paragraphs 7–27 through 7–30 have been used. The specific types of equipment to be used and the detailed makeup of each train must be worked out between the unit transportation officer and the installation transportation officer (CONUS movements) or the transportation officer in the area in which the movement originates (theater of operation movements). Total figures in tables 7–17 through 7–19 reflect the division base only. Figures for the maneuver battalions are shown in table 7–20. Figures in parentheses in tables 7–17 through 7–19 reflect strengths, flatcars, and boxcars required when the division is equipped with M4T6 rather than class 60 bridging.

7–32. Movement of Troop Units on Foreign Railways

a. The capacity of railroads and railway equipment fluctuates widely throughout the nations of the world. Experience in Europe during World War II indicated that under the pressure of all-out war there are few, if any, places in the world where complete troop units can be moved by rail at the same time that the rail net is supplying a major force. A compromise policy was developed in which tracked vehicles and foot troops were moved by rail whenever facilities were available and wheeled vehicles, with their normal towed loads, proceeded on highways.

b. Assumed capacities of foreign rail facilities are indicated in the subparagraphs below.

(1) *Freight cars.*

War flats	50 tons
Medium flatcars	25 tons
Small flatcars	12 tons
Boxcars	10 tons or 25 troops

(2) *Passengers.*

Coaches*	40 troops
Sleeping cars*	32 troops

(3) *Trains.*

Maximum length	40 cars
Maximum net load	400 tons
Maximum troops	1,000 (using boxcars)

*In the forward areas passenger equipment is seldom used for unit moves. The limited amount of available equipment may be used for movement of casuals, convalescents, redeployment groups, or leave trains.

Table 7-15. Recommended Loading of Typical Vehicles and Equipment on Flat Railcars

1	1 Line item number	2 Item	3 Flatcar (length in ft)	4 Unit per car
2	D11048	Carrier, cgo, ammo	40. 0	2
3	D11401	Carrier, comd and recon	40. 0	2
4	D11538	Carrier, CP	40. 0	2
5	D12086	Carrier, pers	40. 0	2
6	E02807	Chassis, tlr, 2½-ton	40. 0	2
7	E02670	Chassis, tlr, 3½-ton	40. 0	2
8	E56577	Combat engr veh, full-tracked	40. 0	1
9	F39241	Crane, wheel-mtd, 5-ton	40. 0	1
10	F39378	Crane, wheel-mtd, 20-ton	40. 0	1
11	H56391	Fftg equip, trk-mtd	40. 0	1
12	J35561	Genr set, tlr-mtd, PU-407	40. 0	4
13	J35698	Genr set, trl-mtd, PU-408	40. 0	4
14	J41178	Genr set, tlr-mtd, PU-209/MR	40. 0	4
15	J41315	Genr set, tlr-mtd, PU-294/G	40. 0	4
16	J41589	Genr set, tlr-mtd, PU-322/G	40. 0	4
17	J41931	Genr set, tlr-mtd, PU-456/G	40. 0	4
18	J74852	Grader, rd, mtz	56. 0	2
19	J93997	Guidance and launching station	46. 0	2
20	J96694	Gun, ADA, SP, 20-mm, XM163	46. 0	2
21	J96819	Gun, twin 40-mm, SP, M42	40. 0	1
22	K56981	Howitzer, 8-in, SP	40. 0	1
23	K57529	Howitzer, 105-mm	46. 0	2
24	K57666	Howitzer, 155-mm, SP	46. 0	2
25	K57803	Howitzer, mdm, 155-mm	40. 0	1
26	K90188	Instl rep shop, trk-mtd	40. 0	1
27	L45534	Launcher rocket, 2½-ton, 762-mm, trk-mtd	40. 0	1
28	L76625	Loader, scoop-type, 2½-cu yd	46. 0	2
29	L85146	Lub and svc unit, tlr-mtd	50. 5	3
30	M68076	Mortar, 81-mm, SP, full-tracked	40. 0	2
31	M68145	Mortar, 107-mm, SP, full-tracked	40. 0	2
32	P11866	Pneumatic tool and compressor outfit, trl-mtd	40. 0	2
33	R50543	Recovery vehicle, full-tracked, lt, tlr-mtd	40. 0	1
34	R50680	Recovery vehicle, full-tracked, mdm	40. 0	1
35	S70243	Stlr, low-bed, wrecker, 12-ton	40. 0	1
36	S70517	Stlr, low-bed, 25-ton, 4-wheel	40. 0	1
37	S70791	Stlr, low-bed, 60-ton, 8-wheel	50. 5	1
38	S72024	Stlr, stake, 12-ton, 4-wheel	40. 0	1
39	S72983	Stlr, tank, fuel, 5,000-gal	40. 0	1
40	S73394	Stlr, tank transporter, 50-ton	46. 0	1
41	S73805	Stlr, van, 6-ton, 4-wheel	40. 0	1
42	S74079	Stlr, van, cgo, 12-ton	40. 0	1
43	S74490	Stlr, van, expansible, 6-ton	40. 0	1
44	T10138	Shop equip, contact maint, trk-mtd	40. 0	2
45	T10275	Shop equip, elec rep, trk-mtd	40. 0	1
46	T10275	Shop equip, elec rep, stlr-, tlr-mtd	40. 0	1
47	T10412	Shop equip, elct rep, stlr-mtd	40. 0	1
48	T13152	Shop equip, org rep	40. 0	1
49	T21235	Shop set, acft maint, stlr-mtd, A-1, trk-mtd	40. 0	1
50	T21372	Shop set, acft maint, stlr-mtd, A-2, trk-mtd	40. 0	1

Table 7-15. Recommended Loading of Typical Vehicles and Equipment on Flat Railcars—Continued

1	1 Line item number	2 Item	3 Flatcar (length in ft)	4 Unit per car
51	V12826	Tank, combat, full-tracked, 76-mm	40.0	1
52	V13100	Tank, combat, full-tracked, 105-mm	40.0	1
53	W76816	Tractor, full-tracked	40.0	1
54	W89557	Tractor, wheeled, warehouse	40.0	3
55	W94030	Tlr, ammo, 1½-ton, 2-wheel	50.5	3
56	W94441	Tlr, utility, 2½-ton, 2-wheel	40.0	5
57	W95263	Tlr, cable reel, 3½-ton	46.0	3
58	W95400	Tlr, cgo, ¼-ton, 2-wheel	46.0	4
59	W95537	Tlr, cgo, ¾-ton, 2-wheel	46.0	3
60	W95811	Tlr, cgo, ½-ton, 2-wheel	46.0	3
61	W96907	Tlr, flatbed, 10-ton, 4-wheel	40.0	1
62	W98825	Tlr, tank, water, 400-gal	46.0	3
63	X38639	Truck, amb, ¼-ton	46.0	3
64	X38776	Truck, amb, ¾-ton	40.0	2
65	X38951	Truck, amb, 1¼-ton	46.0	2
66	X39735	Truck, cgo, ¾-ton	40.0	2
67	X39872	Truck, cgo, ¾-ton, WWN	40.0	2
68	X39883	Truck, cgo, 1¼-ton	46.0	2
69	X40009	Truck, cgo, 2½-ton	50.5	2
70	X40146	Truck, cgo, 2½-ton, WWN	50.5	2
71	X40283	Truck, cgo, 2½-ton, LWB	56.0	2
72	X40831	Truck, cgo, 5-ton, LWB	56.0	2
73	X40968	Truck, cgo, 5-ton, LWB, WWN	56.0	2
74	X43434	Truck, dump, 2½-ton, WWN	46.0	2
75	X43845	Truck, dump, 5-ton, WWN	50.5	2
76	X48846	Truck, lift, fork, 4,000-lb	40.0	10
77	X48914	Truck, lift, fork, 6,000-lb	40.0	8
78	X55627	Truck, platform, utility, ½-ton	40.0	3
79	X56586	Truck, stake, 5-ton	40.0	1
80	X57271	Truck, tank, 2½-ton	50.5	2
81	X57408	Truck, tank, 2½-ton, WWN	40.0	1
82	X59189	Truck, tractor, 2½-ton	46.0	2
83	X59326	Truck, tractor, 5-ton	46.0	2
84	X59463	Truck, tractor, 5-ton, WWN	50.5	2
85	X59600	Truck, tractor, 10-ton	40.0	1
86	X59874	Truck, tractor, 10-ton, WWN	40.0	1
87	X60696	Truck, tractor, wrecker, 5-ton	40.0	1
88	X60833	Truck, utility, ¼-ton	50.5	3
89	X61244	Truck, utility, ¼-ton, 4 x 4	50.5	3
90	X61929	Truck, van, expansible, 2½-ton	40.0	1
91	X62237	Truck, van, expansible, 5-ton	40.0	1
92	X62340	Truck, van, shop, 2½-ton	50.5	2
93	X62477	Truck, van, shop, 2½-ton, WWN	40.0	1
94	X63025	Truck, wrecker, crane, 2½-ton	40.0	1
95	X63162	Truck, wrecker, 2½-ton, WWN	40.0	1
96	X63299	Truck, wrecker, 5-ton, WWN	40.0	1
97	Y35486	Water purification equip set, trk-mtd	40.0	1
98	Y48255	Welding shop, tlr-mtd	46.0	3
99	Z32321	GM Sys, AD, Chaparral, XM48	56.0	2

Table 7–16. Rail Movement—Airborne Division (TOE 57G)

1	1 Unit	2 TOE	3 Personnel	4 Flatcars	5 Boxcars	6 Coaches	7 Pullmans	8 Kitchens	9 Diners
2	HHC	57–4G	136	21	3	3	5	1	1
3	Avn bn	1–55G	353	37	5	7	13	2	2
4	Engr bn	5–25G	578	99	12	11	22	3	3
5	Div arty	6–200G	1, 630	249	31	30	60	7	7
6	Inf bn (9) (each)	7–35G	809	54	9	15	30	3	3
7	DISCOM	29–51G	1, 636	182	26	30	60	7	7
8	Sig bn	11–215G	549	81	10	10	20	2	2
9	Armd cav sqdn	17–75G	632	83	11	12	24	3	3
10	HHC, bde (3) (each)	57–42G	166	17	2	3	6	1	1
11	MP co	19–67G	156	16	2	3	6	1	1
12	Total		13, 449	1, 305	187	250	498	56	56

Table 7–17. Rail Movement—Armored Division Base (TOE 17G)

1	1 Unit	2 TOE	3 Personnel	4 Flatcars	5 Boxcars	6 Coaches	7 Pullmans	8 Kitchens	9 Diners
2	HHC	17–4G	187	34	4	4	7	1	1
3	MP co	19–27G	194	34	4	4	7	1	1
4	Sig bn	11–35G	641	122	15	12	24	3	3
5	Engr bn	5–145G	1, 017	203	24	19	38	4	4
			(1, 019)	(255)	(29)				
6	HHC, bde (3) (each)	17–42G	188	29	4	4	7	1	1
7	Armd cav sqdn	17–105G	905	137	17	17	34	4	4
8	Div arty	6–300G	3, 083	515	63	57	114	12	12
9	ADA bn	44–325T	756	150	16	15	30	4	4
10	DISCOM	29–21G	2, 489	559	66	46	91	10	10
11	Total		9, 836	1, 841	221	186	366	42	42
			(9, 838)	(1, 893)	(226)				

Table 7–18. Rail Movement—Infantry Division Base (TOE 7G)

1	1 Unit	2 TOE	3 Personnel	4 Flatcars	5 Boxcars	6 Coaches	7 Pullmans	8 Kitchens	9 Diners
2	HHC	7–4G	154	31	4	3	6	1	1
3	MP co	19–27G	194	34	4	4	7	1	1
4	Avn bn	1–75G	367	46	6	7	14	2	2
5	Sig bn	11–35G	641	122	15	12	24	3	3
6	Engr bn	5–155G	997	181	22	19	37	4	4
			(999)	(233)	(27)				
7	HHC, bde (3) (each)	7–42G	170	27	3	3	6	1	1
8	Armd cav sqdn	17–105G	905	137	17	17	34	4	4
9	Div arty	6–100G	2, 785	492	60	52	103	11	11
10	ADA bn	44–325T	756	150	16	15	30	4	4
11	DISCOM	29–1G	2, 267	464	55	42	84	2	2
12	Total		9, 576	1, 738	208	180	357	35	35
			(9, 578)	(1, 790)	(213)				

Table 7-19. Rail Movement—Infantry Division (Mechanized) Base (TOE 37G)

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
HHC	37-4G	187	33	4	4	7	1	1
MP co	19-27G	194	34	4	4	7	1	1
Sig bn	11-35G	641	122	15	12	24	3	3
Engr bn	5-145G	1,017	203	24	19	38	4	4
		(1,019)	(255)	(29)				
HHC, bde (3) (each)	37-42G	188	32	4	4	7	1	1
Armd cav sqdn	17-105G	905	137	17	17	34	4	4
Div arty	6-300G	3,083	515	63	57	114	12	12
ADA bn	44-325T	756	150	16	15	30	4	4
DISCOM	29-11G	2,380	540	63	44	88	10	10
Total		9,727	1,830	218	184	363	42	42
		(9,729)	(1,882)	(223)				

Table 7-20. Rail Movement—Maneuver Battalions

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
Inf bn, inf div	7-15G	849	69	15	16	32	4	4
Inf bn (mech), armd div, inf div (mech)	7-45G	924	73	16	17	34	4	4
Tank bn, inf div, armd div, inf div (mech)	17-35G	599	92	11	11	22	3	3

7-33. Troop Movement Planning

a. Scales. In training and preparing for movement all units will become familiar with the use of railway car loading scales or equivalent scales, tables, or templates (para 7-35).

b. Rail Movement Table. All units will maintain tables for movement by *all means* of transportation. A sample rail movement table is provided in table 7-21. This table can be adapted to any type of unit. It is maintained by the division transportation section, as well as by lower units, in compliance with AR 220-10. It is revised to reflect actual strength and equipment on hand upon receipt of movement orders. Organizational equipment and checkable baggage must be listed separately.

c. Types of Tables. When the rail movement has been ordered and the approximate types of equipment requested, each unit prepares the following:

(1) Train consist table (table 7-22).
(2) Entraining table (table 7-23).
(3) Individual train-loading plan (fig. 7-2).

d. Alert Time—(CONUS). An alert is not an order, and rail carriers do not move equipment into position for loading on an alert. It requires 96 hours after request for routing has been placed with the Military Traffic Management and Terminal Service (MTMTS) to start loading a division, assuming that no equipment is available at the installation.

e. Loading Time—(CONUS). Passenger trains require 1 hour for loading. Baggage cars for personal baggage and baggage cars for kitchen purposes are spotted in advance. The time required to load troop units will all vehicles and equipment on freight trains varies with the training status of the unit and the conditions at the loading point. Six hours is used for planning purposes.

Table 7–21. Sample Rail Movement Table

1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
			Strength		Organizational equipment		Checkable baggage		Vehicles and equipment per unit								Railway car requirements per unit									
									Standard vehicles						Special equipment		Passenger			Freight						
									Trailers			Trucks					Coach	Pullman		Boxcar			Flatcar			
	TOE	Unit	Off and WO	EM	Pieces	Weight	Pieces	Weight	Trailer, amph, cargo, ¼-ton 4-ft wide 9-ft long	Etc.	Etc.	Truck, utility, ¼-ton, 4X4 6-ft wide 11.5-ft long	Etc.	Etc.	Items	Shipping length (ft)	48 men	Std number of sec (2 sec)	Tour number sec (3 sec)	Kitchen baggage	Organizational equipment	Checkable baggage	40-ft	42-ft	46-ft	50-ft
2																										
3																										
4																										
5																										
6																										
7																										
8																										
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Notes. 1. This table can be adapted to any type of unit; the number of lines and columns will vary with the type of unit.

2. The division transportation section should keep current a tentative table, in compliance with AR 220-10. Subordinate and separate units should maintain similar tables.

3. Upon receipt of movement order, the table will be revised to reflect actual strength and equipment on hand and to conform to the provisions of the movement order.

4. Organizational equipment and checkable baggage must be listed separately.

7–34. Railway Car Loading Templates

In prepairing loading plans and determining flatcar requirements, car loading templates are helpful. The first step is to prepare templates to a suitable scale (1:25 is recommended) for each item of equipment to be loaded. The transportation officer, or representative of the commercial carrier, can provide dimensions of the usable loading space of the various pieces of rolling stock that can be furnished. A diagram of the usable loading space is then drawn to the same scale as the equipment templates. By placing the templates over the usable loading space, the most economical car loading arrangements can be determined. Tables 7–22 and 7–23 provide sample train consist and entraining tables.

7–35. Individual Train-Loading Plan

a. The division transportation section prepares this plan (fig. 7–2). Copies should be furnished to—

(1) Troop commanders.
(2) Officer in charge of troops (train).

Division

Train number_____ Main number_____

Assignment of Personnel and Equipment to Individual Railway Cars

Front

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16					rear

Continue to last car

Suggested Symbols for Equipment and Vehicles

Equipment	Symbol	Equipment	Symbol	Equipment	Symbol	Equipment	Symbol
Coach	CH	Box	BX	Howitzer, 105-mm	HL		
Pullman, standard	SP	Truck, ¼-ton	TJ	Howitzer, 155-mm	HM		
Pullman, tourist	TP	Trailer, ¼-ton	TQ				
Troop sleeper	TS	Truck, 2½-ton	TC				
Kitchen car	K	Motorcycle	MC				
Kitchen baggage	KB						

Assignment of Units to Cars (by Block Numbers Above)

Unit	Block number	Unit	Block number	Unit	Block number

0-2637

Figure 7–2. Individual train-loading plan.

Table 7–22. Sample Train Consist Table

	1	2	3	4	5	6	7	8	9	10
1	Train number	Transportation groupings	Coach	Pullman		Kitchen or kitchen-baggage	Boxcar	Flat and gondola	Total	Train officers
				Standard	Tourist					
2	1									CO Mess off Surg
3	2									CO Mess off Surg
4	3									CO

Notes. 1. Upon receipt of movement order, commanding general will designate the order in which units will be forwarded.
2. Train consist table is prepared by division transportation section from data appearing on revised rail movement table.
3. Maximum and minimum length of trains (total number of freight and passenger cars) will be prescribed by the origin railroad.
4. Under "transportation grouping," show units that will comprise each individual train.
5. Under "train officers," show by name the officers assigned to each train.

Table 7–23. Sample Entraining Table

	1	2	3	4	5	6	7	8	9	10	11
1	Train number	Main number	Order depart	Loading			Departure		Arrival		Entraining officer
				Point	Date	Hour	Date	Hour	Date	Hour	
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

Notes. 1. Upon completion of train consist table and individual train loading plan, division transportation section will prepare this entraining table.
2. "Train number" will be shown on train consist table.
3. In CONUS, the "main number," which authorizes the movement of each train, will be issued by the Military Transportation Section, Association of American Railroads, through the Military Traffic Management and Terminal Service, Washington, D.C., to the local transportation officer, who will furnish main number to division transportation section. In theaters of operation the main number normally will be issued by the TASCOM transportation officer.
4. Entraining officers will be designated by name.

(3) Entraining officers.

(4) Motor park dispatcher, so that vehicles will arrive at entraining point in the order in which they will be loaded on railway cars.

(5) Local transportation officer.

b. In each block indicate by symbol the specific personnel and equipment assigned to each car.

c. In each block representing an open-top freight car (flatcar or gondola car) indicate by symbol the equipment specifically assigned to each car.

d. In the space provided at the bottom of the plan, assign all cars (freight and passenger) by block numbers (not by railroad car initials and numbers) to the specific units that will occupy them.

Section XII. AIR TRANSPORTATION

7–36. General

a. Movement of Army units by Air Force airlift is of two types—administrative and tactical. The Military Airlift Command (MAC) normally provides supporting airlift for intertheater administrative movements. Tactical Air Command (TAC) units normally provide supporting airlift for intratheater tactical movements. However, at times MAC aircraft may be placed in support of a tactical airlift operation for personnel or materiel airdrop. Under these conditions a TAC unit usually provides the airlift task force commander.

b. An administrative air movement is a simpler operation than a tactical air movement. Loading for administrative air movement operations takes maximum advantage of the aircraft's mission-payload capabilities, and the flight formation is always a column. A tactical air movement is a more complex operation and requires more varied loading methods and formations than those for an administrative air movement. Loading methods for a tactical air movement include parachute assault for personnel and equipment, tactical air landings, and administrative air landings. After the initial parachute assault phase the tactical plan may call for TAC elements to airdrop supplies and equipment as part of the followup echelon. A tactical air movement may include such aircraft formations as V's in trail, in-trail offset, and columns.

c. The planning differs for tactical and administrative air movements. In planning an administrative air movement, the supported Army unit commander must be prepared to provide the MAC airlift commander with his total movement requirement—the number of troops, the weight and cubage of materiel, a separate listing of outsize equipment, and the quantity and description of hazardous cargo to be carried. In such movements the Air Force has the dominant role. In tactical air movements the roles are reversed. Because his mission is the dominant factor, the ground force commander assumes the major role. At the initial planning conference the ground force commander must be prepared to provide the TAC airlift commander the concept of operations, including the ground tactical plan; the total force to be airlifted and supported by air; and preliminary aircraft loading tables, which show the airdrop and air-landing requirements. Joint and concurrent planning is essential throughout the operation.

d. The air movement of a large body of troops normally involves concurrent departures from several airfields and concurrent landings at several terminal landing sites in the objective area. The availability of transport aircraft and base facilities, the urgency of the situation, and the likelihood of hostile interference are major factors that determine the number of installations employed, as well as the number of sorties that the transporting aircraft will make. For staff procedures, air movement tables, and other forms relative to air movements, see FM 55–15.

7–37. Air Movement of Materiel

a. General. Supplies may be airdropped or air-landed. Airdrop methods include container loads prepared for high- or low-velocity rates of descent and free-fall and platform loads. Container loads are limited to supply items and to individual container weights between 250 and 2,200 pounds. Platform loads may consist of supplies or equipment. The smallest platform is 9 feet wide by 8 feet long. All airdrop platforms must be loaded to meet a minimum weight of 35 pounds per square foot. The maximum platform weight, using current standard procedures, is 25,000 pounds. Free-fall techniques

are limited to smaller loads capable of withstanding extremely high ground-impact forces.

b. Airlift Capabilities. The payload capability of each aircraft related to the mission-flight profile and other affecting variables is provided by the supporting airlift commander. The supported commander is not responsible for computing payload capabilities, nor is he expected to do so. Airdrop capabilities are controlled by the airdrop system's limitations, not by the payload of the aircraft. Thus, the 25,000-pound limit for airdrop is related to the airdrop system, not to the aircraft.

7–38. Army Aircraft

a. General. Army aircraft, both fixed wing and rotary wing, are employed to move cargo, personnel, and equipment. Performance standards are affected by many variables, such as load/fuel, altitude temperature, humidity, existing weather, airfield characteristics, and individual aircraft characteristics. The weight-lifting capabilities of all aircraft are particularly dependent on air density or density altitude, which is composed of three variables—altitude, temperature, and humidity. As air density decreases, lift capability decreases. Wind can materially affect operations; and in operations requiring long ranges or maximum lift capabilities, wind may become a critical factor. Payloads may be increased or decreased because of variations in radius or range, density, altitude, and wind velocity. The Army aviation staff officer should be consulted for accurate, detailed computations to meet specific requirements.

b. Rotary-Wing Aircraft.

(1) *General.* Army rotary-wing aircraft (helicopters) are limited in speed and range as compared with fixed-wing aircraft. However, their capability to land and take off vertically permits the delivery of personnel and materiel to and the evacuation from areas of operations inaccessible to fixed-wing aircraft. Likewise, their capability for flight at relatively slow speeds permits continued operations under weather conditions of low ceiling and restricted visibility.

(2) *Planning factors (rotary-wing).* (See also FM 101–10–3, ch. 5.)

(*a*) *Availability.* The number of helicopters available for a mission at any one time depends on the status of maintenance and inspections on the helicopters in the unit. Experience indicates that two-thirds (67 percent) of the helicopters assigned to a unit are available for flying during continuous operations. Normally, a higher percentage of assigned aircraft will be operational for missions of short duration, depending on variables such as previous operational commitments, status of maintenance and inspections, type of aircraft, availability of repair parts, and operational environment.

(*b*) *Cargo.* The dimensions of cargo are restricted only by the size of the aircraft's cargo compartment doors and/or the system used to carry the cargo externally, assuming, of course, that the weight of the package or packages does not exceed the weight limitations for the aircraft under prevailing conditions (fig. 7–3 through 7–8). Typical items of cargo for internal loading are boxes of rations, ammunition, signal equipment, vehicle and aircraft parts, and supplies. Loads too large to fit into the cargo compartment, but under the maximum weight permissible for external loads, may be carried slung under the helicopter to expedite loading and unloading.

(*c*) *Landing facilities.* Provisions must be made for adequate landing sites in planning helicopter movements. The minimum requirements for landing sites are as given below. However, larger areas with cleared approaches are highly desirable to improve safety margins of operation.

OH–23, OH–13	18 meters by 18 meters
UH–19, UH–1A	28 meters by 28 meters
CH–21, CH–34	28 meters by 46 meters
CH–37, CH–47, CH–54	46 meters by 64 meters

(*d*) *Maintenance.* Maintenance facilities should be provided at primary landing sites, the minimum requirement being a sheltered area that provides adequate cover for organizational maintenance on the helicopters. For planning purposes 7 organizational maintenance man-hours per flying hour may be considered average for the UH–19, 10.8 hours for the CH–21 and CH–34, 15.6 hours for the CH–37 and CH–47, and 6 hours for the UH–1A, –B, –D aircraft.

(*e*) *Hours of operation.* The average number of hours of operation per day for extended periods should not exceed the daily equivalents of the annual flying hours' program contained in SB 1–1 for the type of helicopter employed.

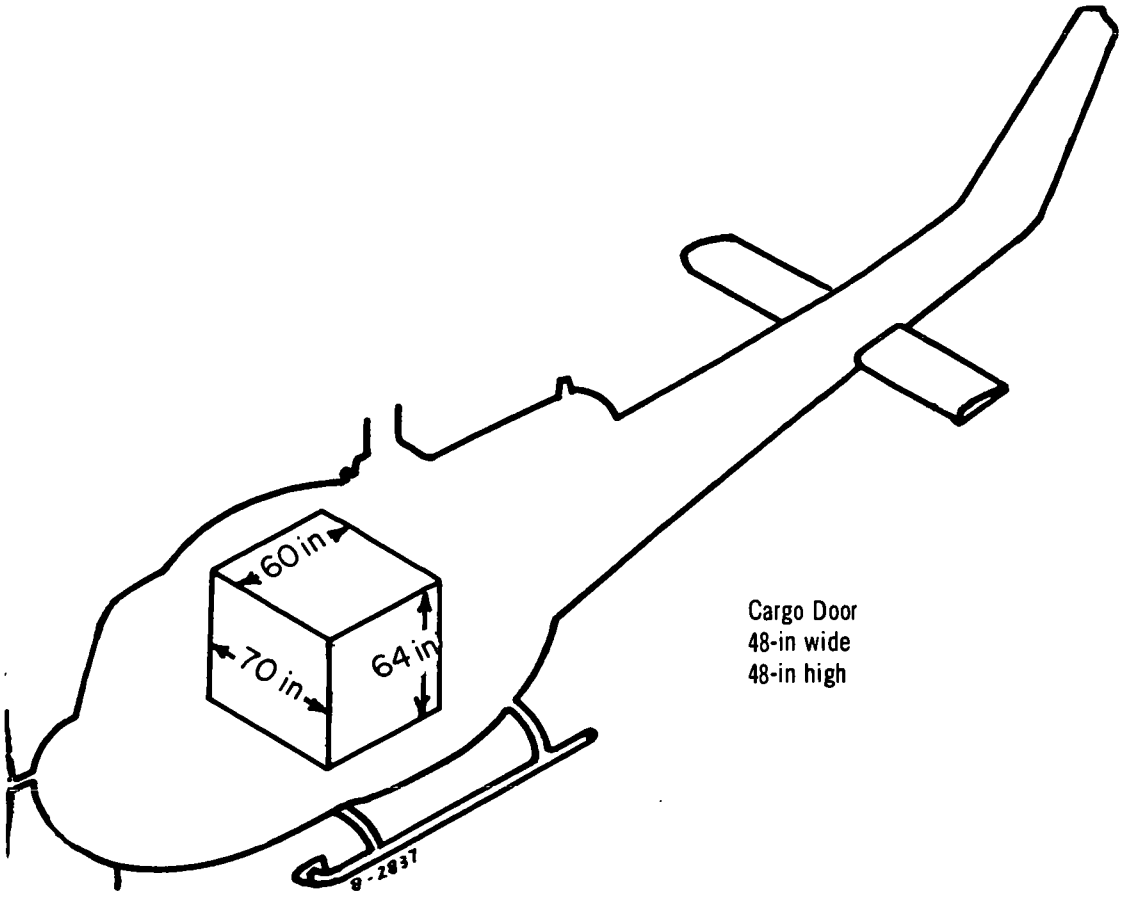


Figure 7-3. Iroquois (UH-1A).

(*f*) *Loading and unloading time.* The factors given below are for planning purposes and presume that the aircraft has been properly prepared for the personnel or cargo it is to transport. The times do not include palletizing general cargo for internal loading or rigging slings on cargo for external transport.

Personnel:

Troops	3 minutes
Casualties	10 minutes
Cargo internal in fuselage:	
Single vehicles	5 minutes
Vehicles with trailers	15 minutes
Palletized cargo (by hand).	20 minutes
Cargo suspended beneath helicopter:	
Hookup time only	30 seconds

(*g*) *Planning guide.* Table 7-24 can be used as a planning guide for determining the approximate helicopter requirements for transporting cargo or personnel. Crewmen should not be counted against payload weight or troop capacity. The recommended weight of payload and fuel is for extended operation at 60° F., no wind, and at sea level. For one-time emergency flights this figure may be increased to the design limit of the helicopter. Technical manuals in the 55-1520-10-series for the respective aircraft give the lift capability at temperatures other than 60° F. and at higher elevations.

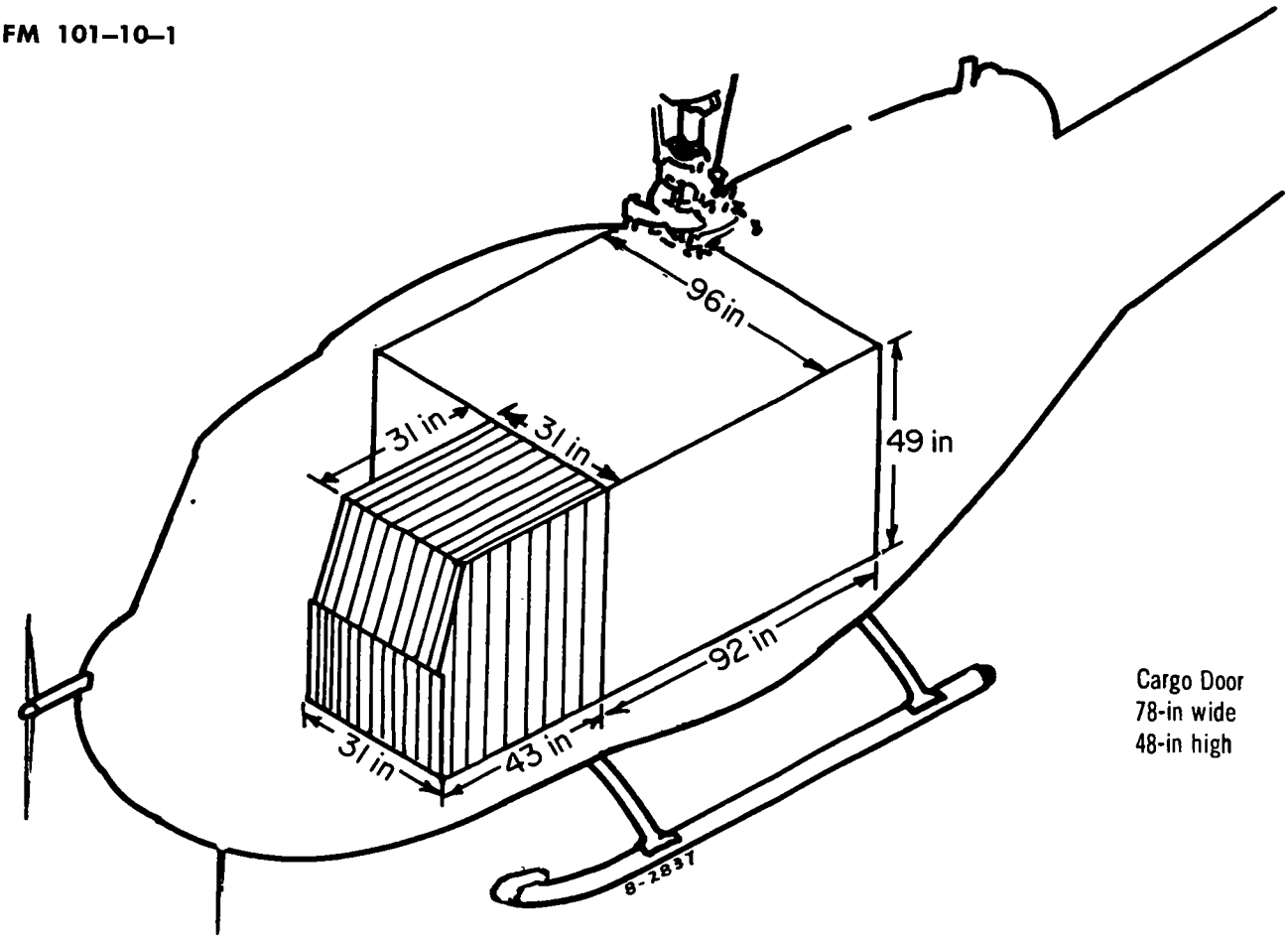


Figure 7–4. Iroquois (UH–1D).

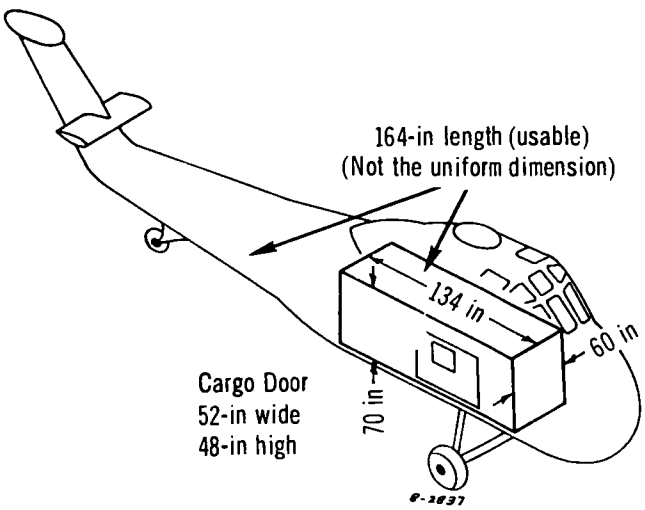


Figure 7–5. Choctaw (CH–34A).

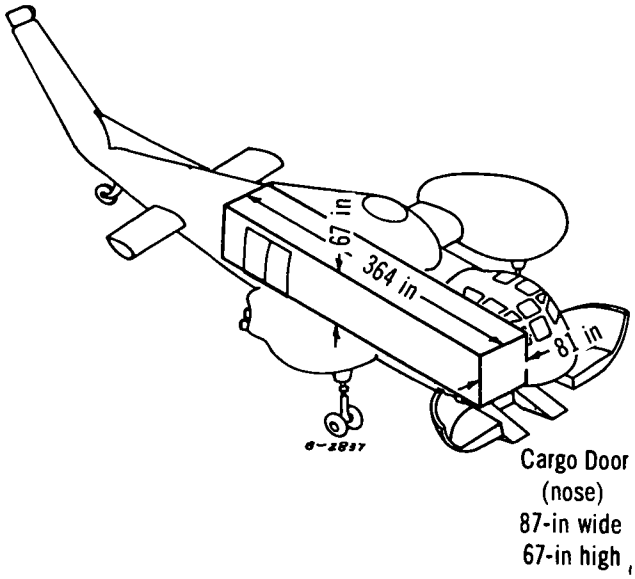


Figure 7–6. Mojave (CH–37A).

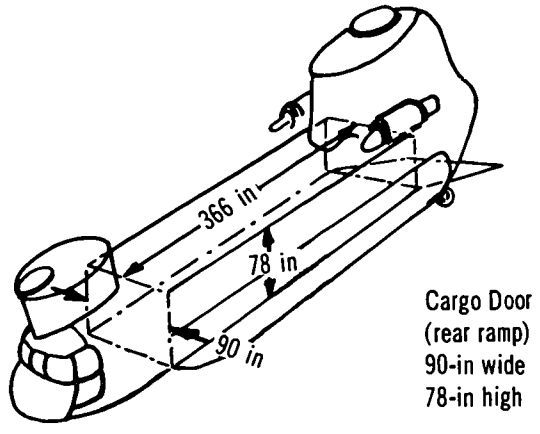


Figure 7-7. Chinook (CH-47).

(*h*) *Determination of transport helpicopter requirements.*

1. Most helicopter operations will be of the short-haul type and may require that more than one-round trip (sortie) be flown in support of the movement.

2. To determine the number of helicopters or units required to accomplish a given mission or the capabilities of helicopters on a specific mission, the staff planner should use the following formulas:

$N = \frac{HS}{D}$, when

N = number of round trips (sorties per aircraft per day). This figure must be the resultant next lower whole number if a fraction is involved; a sortie must complete a round trip.*

S = average sortie speed of aircraft in knots. For planning purposes use cruising speed unless some other speed is specified.

D = round-trip distance in nautical miles. This distance must be the actual distance flown rather than the airline distance from origin to destination. If the airline distance is used, add 15 percent to obtain estimated flight distance.

H = number of operational hours available.

$O = \frac{T}{N \times P}$, when

O = number of operational aircraft required or available daily.

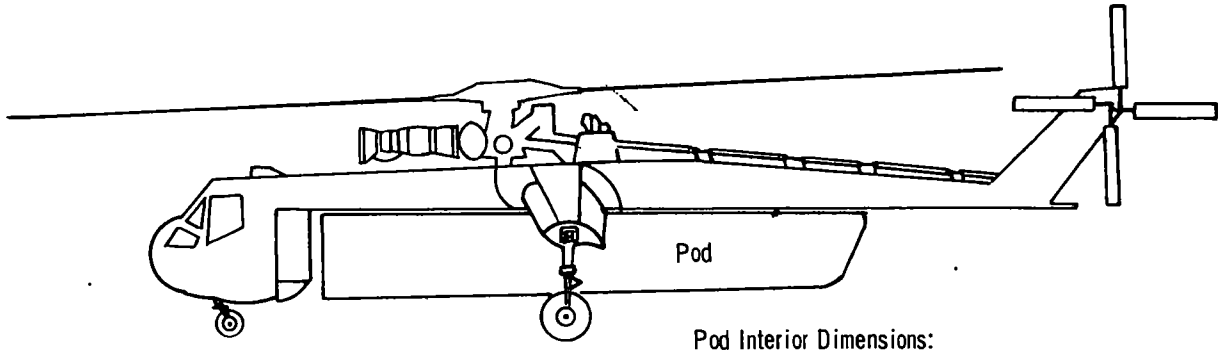
T = tonnage to be moved or tonnage that can be moved.

P = payload of type of aircraft used.

$A = 1.5 \times O$, when

A = number of aircraft required or available to carry out a sustained operation. (This formula applies the daily availability factor or 67 percent to 0 to obtain A or to A to obtain 0.)

*If service and fuel are available at both pickup and delivery points, one-half sortie can be computed as a lift. (A lift is the movement of a load from origin to destination.) This would require that the helicopters remain in the delivery point area for service, which is normally undesirable.



Pod Interior Dimensions:

366-in long
78-in high
138-in wide

Figure 7-8. Flying Crane (CH-54).

323-256 O - 69 - 24

Table 7-24. Army Helicopter Payload Guidance

1	2	3	4	5	6	7	8
Line item number	Model	Cargo area (ft) (Length—L, height—H, width—W)	Cargo door (ft) (height—H, width—W)	Payload plus fuel (lb)	Troop capacity	Litter capacity	Average cruising speed (knots)
2 K30092	CH-21B	L 20.0 W 3.8 H 5.5	H 4.9 W 3.1	4,950	20	12	77
3 K30097	CH-21C	L 20.0 W 3.8 H 5.5	H 4.9 W 3.1	4,900	20	12	77
4 K30254	CH-34C	L 13.4 W 5.0 H 5.8	H 4.0 W 4.2	4,800	18	8	94
5 K30291	CH-37B	L 30.3 W 7.7 H 6.7	Side H 6.0 W 6.0 Nose H 3.9 W 7.3	8,400	23	24	98
6 K30378	CH-47A	L 30.5 W 7.5 H 6.5	Fwd door H 5.5 W 3.0 Ramp door H 6.5 W 7.5	9,700	33	24	130
7 K31749	UH-1B	L 4.0 W 6.7 H 4.0	H 4.0 W 4.0	1,900	6	3+attnd	106
8 K31786	UH-1D	L 7.7 W 8.0 H 4.1	H 4.0 W 6.2	2,200	9	6+attnd	102
9 K31923	UH-19C	L 10.0 W 5.5 H 6.0	H 4.0 W 4.0	2,800	10	6	84
10 K31940	UH-19D	L 10.0 W 5.5 H 6.0	H 4.0 W 4.0	2,550	10	6	75

3. This method of determining helicopter requirements is particularly applicable to movement of supplies or troops when combat loading is not a consideration. The planner should use a planning worksheet to determine aircraft requirements for airlanded assault operations. He uses the planning worksheet to develop loads that provide for tactical integrity of the combat units and combat loading of each aircraft. The planner can use the method of determining aircraft requirements described herein to *estimate* requirements for assault operations by adding 10 percent to the unit personnel and equipment tonnage to allow for combat loading.

4. Examples.

(a) A division has been allocated 18 CH-34 helicopters for 3 days to assist in moving supplies from field army supply points to division distribution points. The round-trip actual flight distance is 80 nautical miles. The division G4 desires to know what the daily lift capacity of this helicopter company will be for this mission.

Solve first for N (number of sorties per aircraft per day):

$$N=\frac{HS}{D},\ N=\frac{4\times104}{80},$$

N=5.2 or 5 sorties per day.

Solve next for O (number of operational aircraft available):

O=67 percent of A (18),

O=12 operational aircraft per day.

Solve for T (daily tonnage capability of available aircraft):

$$O=\frac{T}{N\times P},\ 12=\frac{T}{5\times1.89},$$

T=113.4 STON per day.

(b) The field army G4 has a requirement to move 300 STON of cargo per day for 8 days from the field army service area to the 20th Infantry Division. Because of terrain and enemy action, this movement cannot be made by surface means. The G4 is computing the number of CH-34 and/or helicopter companies that will be required to accomplish this mission. The estimated flight distance from the 20th Infantry Division's distribution points is 28 nautical miles.

P=1.89 STON.

T=300 STON.

S=104 knots.

D=56 nautical miles (round-trip distance).

$$N=\frac{4\times104}{56},\ N=7.4 \text{ or } 7 \text{ (sorties per aircraft)}.$$

$$O=\frac{300}{7\times1.89},\ O=22.6 \text{ or } 23 \text{ (helicopters)}.$$

A=1.5×23, A=35 helicopters or approximately 2 companies of CH-34 helicopters.

c. Fixed-Wing Aircraft.

(1) *General.* Army fixed-wing aircraft are limited in speed and range in comparison with larger transport-type aircraft. The capability of Army fixed-wing aircraft to land and take off from selected small, unprepared areas permits the delivery of personnel and materiel to and the evacuation from areas of operations inaccessible to larger aircraft. The capability of Army fixed-wing aircraft to fly slowly and maintain a high degree of maneuverability further enhances their value in forward areas under combat conditions.

(2) *Planning factors (fixed-wing).* (See also FM 101-10-3, ch 5.)

(*a*) *Availability.* The operation plan should be based on the availability of 75 percent of the assigned aircraft for substained operations. A higher availability ratio of 95 percent may be obtained for operations of short duration (less than 6 days). This higher availability ratio will depend on the status of maintenance and inspections, repair parts, time available for maintenance, and degree of skill of maintenance personnel.

(*b*) *Cargo.* Cargo may be delivered by three means—free fall, parachute, or airlanding. The receiving unit normally requests the type of delivery to be used. The size and amount of cargo that may be loaded internally are governed by the following (figs. 7-9 and 7-10):

1. Size of compartment door.
2. Compartment door location with respect to the cargo compartment.
3. Size of cargo compartment.
4. Lift capability of the aircraft used.

(*c*) *Landing facilities.* The development of a landing area adequate for prolonged operations or for accommodation of frequent traffic is a continuous operation. The planner must make provisions for an adequate landing area when planning aircraft movements. The minimum requirements for landing areas are indicated in table 7-25.

Table 7-25. Minimum Landing Area Requirements

	1	2	3
1	Aircraft at maximum gross weight	No wind conditions at sea level over 15-m obstacle	
		Length (m)	Width (m)
2	O-1A	250	15
3	U-6A	370	20
4	U-8D	760	20
5	U-1A	460	20
6	OV-1A	900	20
7	U-9C	650	20
8	U-10A	200	15
9	U-21A	260	20
10	T-41B	200	20
11	T-42A	490	20

(*d*) *Maintenance.* Under normal climatic conditions no extensive facilities are required for organizational maintenance. Special equipment and facilities are required for operation in extreme climatic conditions. Direct support field maintenance units are equipped for field operations under normal climatic conditions. Special considerations for equipment and facilities are required under extreme conditions. For man-hour requirements

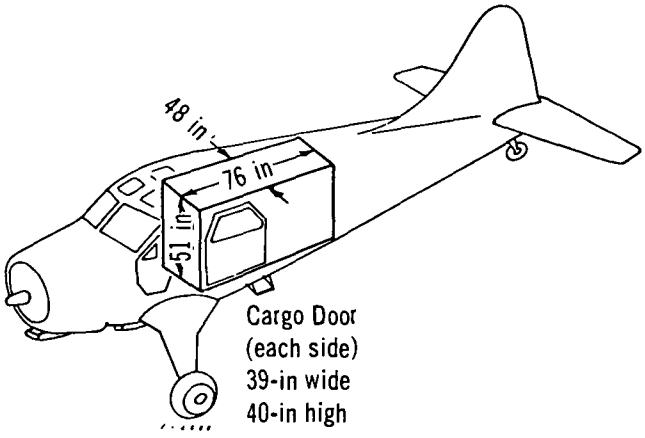


Figure 7-9. Beaver (U-6A).

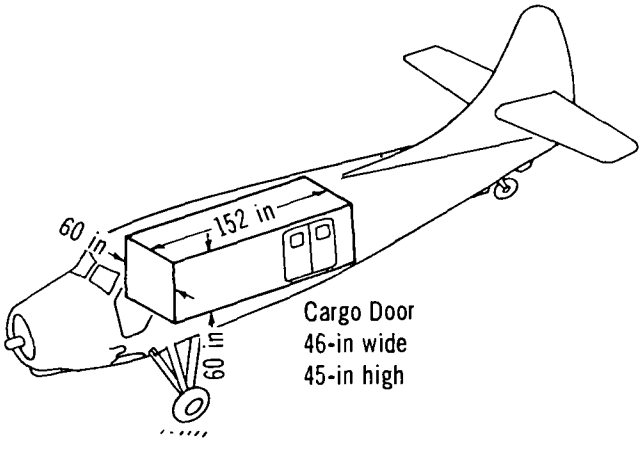


Figure 7-10. Otter (U-1A).

for aircraft maintenance, the planner should consult applicable publications.

(*e*) *Hours of operation.* Based on a sustained operation, average fiying hours per airplane should not exceed the daily equivalents of the annual flying hours' program contained in SB 1-1.

(*f*) *Loading time.*
Personnel:
Troops—2 to 3 minutes (depending on type of aircraft).
Casualties—10 minutes.
Cargo:
Internal in fuselage (depending on type of cargo)—10 to 30 minutes.
External beneath wings of airplane—10 minutes.

(*g*) *Unloading time.*
Personnel:
Troops—1 minute.
Casualties—10 minutes.
Cargo:
Internal in fuselage—5 minutes.
External (airlanded)—10 minutes.
Parachute—30 seconds.
Free fall—10 seconds.

(*h*) *Payload guidance.* Table 7-26 can be used as planning guide for determining the approximate aircraft requirements for transporting cargo or personnel. Crewmen should not be counted against payload weight or troop capacity. The recommended weight of payload and fuel is for extended operation at 60° F., no wind, and at sea level. For one-time emergency flights this

Table 7-26. Army Fixed-Wing Aircraft Payload Guidance

	1	2	3	4	5	6	7	8
1	Line item number	Model	Cargo area (ft) (length—L, width—W, height—H)	Cargo door (ft) (height—H, width—W)	Payload plus fuel (lb) (basic mission)	Troop capacity	Litter capacity	Average cruising speed (knots)
2	A30621	U-1A	L 12.2 W 4.3 H 4.9	H 3. 8 W 3.7	1,800	8	4+ 3 ambt & 1 attnd.	104
3	A30671	U-6A	Personnel only	NA	1,650	5	2+2 ambt & 1 attnd.	97
4	A30721	U-8D	Personnel only	NA	2,050; baggage max 562.	5	None	140
5	A30821	U-8F	Personnel only	NA	2,150; baggage max 300.	5	None	130
6	A30921	U-9C	Personnel only	NA	2,650	5	None	200
7	A30971	U-10A	Personnel, lt cgo	NA	1,700	2	None	139

figure may be increased to the design limit of the aircraft. The 55–1510–10 series of technical manuals for the respective aircraft give the lift capacity at temperatures other than 60° F. and at higher elevations.

7–39. Air Force Transport Aircraft

a. For general considerations and procedures governing the employment of Air Force transport aircraft in joint operations, see FM 61–100; FM 100–5; FM 101–5; and chapter 5, FM 101–10–3.

b. In planning for joint airborne operations the commander and staff officer should be familiar with the following basic terms:

(1) *Allowable cargo load (air)*—The weight of cargo in pounds that can be loaded into an aircraft for a specific mission. In an airborne operation the Air Force commander announces the allowable cargo load (ACL) for each type of aircraft. The ACL of an aircraft varies with distance and certain other conditions. The greater the distance, the greater the weight of fuel and resultant reduced ACL. In radius operations the ACL for the distance traveled for parachute operations may be greater than that for airlanded operations because there is a necessary safety restriction on the total weight of the aircraft on landing. The ACL for an aircraft can be determined for any range or radius by referring to graphs provided for that purpose.

(2) *Radius of action*—The maximum distance to which an airplane can safely travel and return without refueling. Operations under radius conditions are those in which aircraft deliver troops or materiel at a destination and return without refueling.

(3) *Range*—The distance from the takeoff point to the point where an airplane delivers its cargo load (safety margin of reserve fuel included). Refueling is required to return to the original takeoff point.

c. A general description of the various types of military aircraft and their technical characteristics and performance data, to include cargo-distance graphs; cargo compartment dimensions; troop transport, litter transport, parachutist, and air delivery provisions, is contained in TM 57–210.

d. Planning data for determining Air Force transport aircraft requirements for movement of units of a typical field army are contained in paragraph 4–12.

e. Table 7–27 is included for use as a guide to commanders and staff officers in computing typical load requirements for airlifting Army aircraft in Air Force transport aircraft. Total requirements of Air Force transport aircraft necessary to lift complete TOE units may be determined by combining aircraft requirements based on the data in the table with the tabulated requirements for the aviation unit concerned in paragraph 4–12. Space rather than weight is the critical factor in transporting aircraft only. The weight figures shown in the table include an estimated 240 pounds per ton of aircraft for crating and cradling materials.

Table 7–27. Typical Loads for Airlifting Army Aircraft in Air Force Transport Aircraft

1	1	2	3	4	5	6
	Air Force transport aircraft	Army aircraft			Total load	
		Type	Number	Degree of disassembly	Pounds	STON
2	C–124	O–1	3	Wings	5,577	2.8
3	C–124	O–1	4	Wings, elevators, and vertical fin	7,437	3.7
4	C–130	O–1	2	Wings, elevators, and vertical fin	3,718	1.9
5	C–141	O–1	3	Wings, elevators, and vertical fin	5,577	2.8
6	C–124	U–1	2	Wings, elevators, propellers, and landing gear	10,752	5.4
7	C–130	U–1	1	Wings, elevators, propellers, and landing gear	5,376	2.7
8	C–141	U–1	2	Wings, elevators, propellers, and landing gear	10,752	5.4
9	C–124	U–6	2	Wings, elevators, and reduction of landing-gear width to 118 in	7,056	3.5
10	C–130	U–6	1	Wings, elevators, and reduction of landing-gear width to 113 in	3,527	1.8
11	C–141	U–6	2	Wings, elevators, and reduction of landing-gear width to 113 in	7,056	3.5
12	C–130	OH–6A	3	Four rotor blades fold to 24 feet	1,153	0.6
13	C–124	OH–13	2	One main rotor blade (two)	3,786	1.9

Table 7-27. Typical Loads for Airlifting Army Aircraft in Air Force Transport Aircraft—Continued

1	1	2	3	4	5	6
	Air Force transport aircraft	Army aircraft			Total load	
		Type	Number	Degree of disassembly	Pounds	STON
14	C-130	OH-13	2	Main rotor blade and mast (one) and one main rotor blade (one)	3, 786	1. 9
15	C-141	OH-13	3	Main rotor blade and mast (two) and one main rotor blade (one)	5, 679	2. 8
16	C-124	OH-23	2	One main rotor blade, both control blades, and antennas	4, 032	2. 0
17	C-130	OH-23	2	Head and blades	4, 032	2. 0
18	C-141	OH-23	4	Head and blades	8, 062	4. 0
19	C-124	UH-1	2	For UH-1A: (from each helicopter) one main rotor blade, stabilizer bar from main rotor head, synchronized elevator, one tail rotor, and antennas. For UH-1B and UH-1D: antennas, stabilizer bar assembly, hub assembly, main rotor blades, mast and swashplate assembly, one tail rotor blade, and synchronized elevators.	8, 666	4. 3
20	C-130	UH-1	1	For UH-1A: main rotor blades, head and mast, one tail rotor, synchronized elevator, and all antennas. For UH-1B and UH-1D: antennas, main blades, mast and swashplate assembly, synchronized elevators, exhaust cowling, and exterior mirror	4, 333	2. 2
21	C-141	UH-1	2	For UH-1A: main rotor blades, head and mast, one tail rotor, synchronized elevator, and all antennas. For UH-1B and UH-1D: antennas, main blades, mast and swashplate assembly, synchronized elevators, exhaust cowling, and exterior mirror	8, 666	4. 3
22	C-124	UH-19	2	Head, blades, and tail cone	12, 764	6. 4
23	C-130	UH-19	2	Head, blades, landing gear, and tail cone	12, 764	6. 4
24	C-141	UH-19	3	Head, blades, landing gear, and tail cone	19, 146	8. 6
25	C-124	CH-21	1	Blades and landing gear; body in two sections	10, 416	5. 2
26	C-130	CH-21	-------	Degree of disassembly required to transport in this aircraft is uneconomical		
27	C-141	CH-21	1	Blades and landing gear; body in two sections	10, 416	5. 2
28	C-124	CH-34	2	Head, blades, landing gear, tail pylon, and canopy assembly	17, 987	9. 0
29	C-130	CH-34	-------	Degree of disassembly required to transport in this aircraft is uneconomical		
30	C-141	CH-34	1	Head blades, landing gear, tail pylon, and canopy assembly	8, 993	4. 5
31	C-133	CH-47A	2	Rotor blades, hubs, transmission, pylons, pods, engines	36, 200	18. 1

Section VIII. INLAND WATERWAYS

7-40. General

a. Types. Inland waterways include all navigable inland waters, such as rivers, lakes, inland channels, and canals, of sufficient depth to accommodate cargo traffic. The following are the general types into which inland waterways are grouped:

(1) Lakes.
(2) Rivers.
(3) Ship canals.
(4) Barge canals.
(5) Intracoastal waterways.

b. Characteristics. The characteristics of a waterway that must be considered in an analysis of its capabilities are as follows:

(1) Restricting widths and depths of channel.
(2) Vertical and horizontal bridge clearance.
(3) Location of dams and other bars to navigation.
(4) Location of locks, dimensions, and timing.
(5) Seasonal floods and droughts, their frequency and duration.
(6) Normal freezeup and opening dates.
(7) Hazards to navigation, such as rapids and falls.
(8) Speed and fluctuation of current.
(9) Waterway maintenance requirements.
(10) Changes of channel.

7–41. Waterway Capacity Estimates

a. Liniting Factors. Factors, other than waterway characteristics, having a limited effect on waterway capacity are—

(1) Availability of suitable barges or craft.

(2) Availability of suitable operating personnel.

(3) Availability and adequacy of terminals and terminal facilities.

b. Turnaround Time. This factor is defined as the time required for a barge or craft to load, travel to destination, unload, return to origin, and be ready to resume loading. It has considerable effect on waterway capacity and involves—

(1) Length of haul, taken as round-trip distance.

(2) Speed in still water—6 kilometers per hour.

(3) Speed and direction of current.

(4) Loading and unloading time—computed at 8.4 STON per barge per hour.

(5) Time consumed in locks.

(6) Operating hours per day—normally 20, allocating the remaining 4 for maintenance, refueling, restoring, etc.

c. Capacity Determination, Craft Available To Fill or Exceed Waterway Capacity. When sufficient barges or craft are available to fill or exceed waterway capacity, the daily tonnage that may be moved over the waterway is equal to one-half the number of craft per day that can be passed through the most limiting constriction (e.g., a lock, lift bridge, narrow channel) times the average net capability of the craft in use.

d. Capacity Determination, Craft Not Available To Fill or Exceed Waterway Capacity. The following formula may be used to determine the number of tons a given number of barges can transport a given distance daily:

$$\frac{\text{Number of barges} \times \text{tons per barge} \times \text{hours of operation per day}}{\text{turnaround time in hours.}} = \text{tons moved daily.}$$

Example: Determine the daily tonnage 20 barges of 270 STON capacity each can move 90 kilometers forward with no lost time in locks and negligible effect due to current—

$$\text{Travel time per barge} = \frac{90+90}{6} = 30 \text{ hours.}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 270}{8.4} = 64.3 \text{ hours.}$$

Turnaround time per barge = 30 + 64.3 = 94.3 hours.

$$\frac{20 \text{ barges} \times 270 \text{ tons per barge} \times 20 \text{ hours' daily availability}}{94.3 \text{ hours' turnaround time}} = 1{,}145.3 \text{ STON daily.}$$

7–42. Floating Equipment Requirements

a. Cargo Craft. To determine the number of barges or cargo craft required to move a given tonnage a given distance forward daily, use the following formula:

$$\frac{\text{Daily tonnage} \times \text{hours' turnaround time}}{\text{Tons per barge} \times \text{hours of operation daily}} = \text{number of barges required.}$$

Example: Determine the number of barges having a capacity of 500 STON required to move 1,000 STON daily a distance of 150 kilometers forward, assuming no lost time in locks and negligible effect due to current.

$$\text{Travel time per barge} = \frac{150+150}{6} = 50 \text{ hours}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 500}{8.4} = 119 \text{ hours.}$$

Turnaround time per barge = 50 + 119 = 169 hours.

$$\frac{1{,}000 \text{ tons daily} \times 169 \text{ hours' turnaround}}{500 \text{ tons per barge} \times 20 \text{ hours' daily operation}} = 16.9 \text{ barges} = 17 \text{ barges required.}$$

b. Tugs and Towboats. Since a single tug or towboat can normally be used to tow more than one barge and since loading time is not a consideration in tug or towboat availability, it follows that fewer tugs than barges will be required in any given situation. To determine the number of tugs or towboats required to operate a given number of

barges in a given situation, use the following formula:

$$\frac{\text{Total number of barges} \times \text{turnaround time for tugs in days}}{\text{number of barges per tow} \times \text{turnaround time for barges in days}} = \text{number of tugs.}$$

Example: Determine the number of tugs required to operate 400 barges, when each tow consists of five barges, turnaround time for barges is 4 days, and turnarouud time for tugs is 2 days.

$$\frac{400 \text{ barges} \times 2 \text{ days' tug turnaround}}{5 \text{ barges per tow} \times 4 \text{ days' barge turnaround}} = 40 \text{ tugs required.}$$

Section IX. OCEAN SHIPPING

7-43. Definition of Ship-Loading Terms

a. Units of Weight.

(1) Short ton (STON)—2,000 pounds. Used by U.S. ships in domestic trade.

(2) Long ton (LTON)—2,240 pounds. Used by U.S. ships in foreign trade.

(3) Metric ton—2,205 pounds. Used by foreign shipping.

b. Units of Volume.

(1) Measurement ton (MTON)—40 cubic feet. Used by U.S. ships in foreign trade.

(2) Register ton—100 cubic feet. (This tonnage is used for working out a basis to collect entry fees for the vessel and has no direct bearing on the cargo-carrying capacity of the vessel.)

c. Units of Distance and Speed.

(1) Distance (nautical mile)—6,076 feet.

(2) Speed (knot)—1 nautical mile per hour.

d. Gross Tonnage. Gross tonnage (gross register tonnage) is the entire internal cubic capacity of a ship expressed in register tons of 100 cubic feet each.

e. Net Tonnage. Net tonnage (not register tonnage) of a ship represents the cargo and passenger-earning spaces that remain after deduction from the gross tonnage of space for the crew, powerplant, fuel, and operation of the vessel. Net tonnage is expressed in tons of 100 cubic feet each.

f. Deadweight Tonnage. Deadweight tonnage is the carrying capacity of a ship expressed in LTON and represents the difference between displacement loaded to maximum draft allowed by law and displacement light.

g. Displacement Tonnage Light. Displacement tonnage light is the weight of a ship in LTON and excludes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use on a voyage.

h. Displacement Tonnage Loaded. Displacement tonnage loaded is the weight of a ship in LTON and includes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use on a voyage.

i. Cargo Deadweight Tonnage. Cargo deadweight tonnage is the weight-lifting capacity of a ship in LTON remaining after deducting from the deadweight tonnage the weight of fuel, water, stores, dunnage, and such other items as may be necessary for a voyage.

j. Grain Cubic Capacity. Grain cubic capacity is the maximum space available for cargo measured in cubic feet. The measurements are taken to the inside of the shell plating of the ship or to the outside of the frames and to the top of the beams or underside of the deck plating. If a bulk cargo of grain is loaded, the grain flows in between the frames and beams and occupies the maximum space available. This is the grain cubic capacity.

k. Bale Cubic Capacity. Bale cubic capacity of a ship is the number of cubic feet of space available for cargo measured to the inside of the cargo battens, on the frames, and to the underside of the beams.

l. Lost Space. Lost space (broken stowage, stowage loss) is the difference between the ship's cubic measurement and total measurement of the cargo. Although allowance for lost space varies substantially with individual types of cargo, the average allowance for the entire spread of military cargo amounts to the following, which is given in percentage of bale cubic capacity:

	Percentage
(1) Administrative loading	20
(2) Commodity loading	30
(3) Combat loading	50
(4) Selective loading	30

m. Stowage Factor. A stowage factor is a relationship of cubage to weight. As applied to cargo, it is the ratio of the number of cubic feet of space occupied by the cargo to the weight of the cargo in LTON. The units in which a stowage factor is expressed are "cubic feet per LTON." In individual items or types of cargo the stowage factor is the amount of cubic feet of space occupied by 1 LTON.

n. Vessel Stowage Factor. Vessel stowage factor = (bale cubic capacity − estimated lost space) + (cargo deadweight tonnage − estimated weight of deck cargo).

(1) To determine whether weight or volume of a specific commodity will be the limiting factor in loading a Liberty-type ship of 400,000-cubic-foot capacity after deducting lost space and with a cargo capacity tonnage (less deckload) of 8,000 LTON:

$$\text{Vessel factor} = \frac{400{,}000 \text{ cubic feet}}{8{,}000 \text{ LTON}} = 50 \text{ cubic feet/LTON}$$

(2) Under the conditions stated above, the vessel will have its cargo space completely filled and its weight capacity used if stowed with cargo occupying 50 cubic feet to the LTON. In this example, for cargo occupying more than 50 cubic feet per LTON, volume will be the limiting factor. For cargo occupying less than 50 cubic feet per LTON, weight will be the limiting factor.

7–44. Shipping Reference

See FM 60–30 for detailed shipping reference data.

7–45. Commercial Loading Methods

a. Bulk and General Cargo Loading. Bulk and general cargo loading is the stowage of supplies to use the entire carrying capacity of a ship, disregarding segregation of cargoes either by class, technical service, or commodity. It permits maximum economy in shipping space, but requires additional labor and facilities at destination for segregation and assembly of supplies for use.

b. Multiple Port Discharge. Multiple port discharge uses bulk stowage of supplies for more than one destination, loaded to maintain availability for discharge of proper items in the order of arrival at the ship's scheduled destinations.

7–46. Military Loading Methods

Military cargo is loaded on board ships according to its intended employment at its destination. There are four distinct types of military loading.

a. Combat Loading. Combat loading gives primary consideration to the facility with which troops, equipment, and supplies can be unloaded and ready for combat on landing rather than to economical utilization of ship space. There are three methods of combat loading. They differ mainly as to the degree of availability of troop units for landing and as to the tactical integrity of the units.

(1) *Combat unit loading.* Combat unit loading is the loading of an assault troop unit, together with its essential combat equipment and supplies, in a single ship in such a manner that the unit will be available to support the tactical plan upon debarkation and to provide maximum flexibility to meet possible changes in the tactical plan.

(2) *Combat organizational loading.* Combat organizational loading is the loading of a troop unit with its equipment and supplies on the same ship in such a manner as to be available for unloading in a predetermined order. It permits debarkation of complete units and equipment, which are available for employment after assembly ashore. This method is more economical in ship space than combat unit loading.

(3) *Combat spread loading.* Combat spread loading is the loading of some of the troops, equipment, and initial supplies of a unit on one ship and the remainder on one or more ships. This method is commonly used with troop units with heavy equipment. Units so loaded are available for employment at established beachheads or ports after a lapse of time necessary to assemble them on land with their equipment and supplies.

b. Administrative Loading. Administrative loading is a method of loading troops and/or equipment and supplies in a ship for maximum utilization of personnel and cargo space. No consideration is given to debarkation priorities. Therefore, equipment and supplies must be unloaded and sorted before they can be used. This type of loading may be employed effectively for reinforcing and maintaining an expeditionary force and for carrying supplies and equipment for the buildup forces.

c. Commodity Loading. Commodity loading is method of loading in which various types of cargo,

such as ammunition, rations, or boxed vehicles, are loaded together so that each commodity can be discharged without disturbing the others.

d. Selective Loading. Selective loading is the arrangement and stowage of equipment and supplies abroad a ship in a manner designed to facilitate issue to units. Specific items may be discharged on call.

7–47. Nomenclature of Maritime Administration Oceangoing Vessels and Characteristics of Cargo Vessels

a. General. There is such a large variance in the cubic-carrying capacity of vessels of the same type because of various alterations and special fittings, that the cubic feet and tonnage figures shown in tables 7–28 through 7–35 are, in most instances, minimum and apply to one type only of the designated vessels.

b. Nomenclature of Vessels. Table 7–28 provides nomenclature of cargo vessels and includes deadweight tonnage figures and a brief description of each vessel.

c. Cargo Vessel Characteristics. Tables 7–29 through 7–35 provide data on the characteristics of cargo vessels, to include physical characteristics, capacities, and deadweight tonnage figures. The five types of ships shown in tables 7–33 through

Table 7–28. Nomenclature of Vessels

1	1 Type	2 Deadweight tonnage	3 Remarks
2	B7	5, 700	Concrete hull, cargo barge, nonpropelled.
3	C1–A	7, 400	Designed for general cargo in world trade; steam-turbine and motor propelled (two modifications).
4	C1–B	9, 100	Designed for general cargo in world trade; steam-turbine and motor propelled (three modifications).
5	C1–M	5, 000	Designed for general cargo; motor propelled.
6	C1–S	5, 000	Concrete ship designed for cargo purposes; steam-reciprocating-engine propelled.
7	C2	9, 300	Designed for general cargo in world trade; majority steam-turbine propelled (several modified types). Modified types were used mostly as hospital ships in World War II.
8	C3	9, 900	Combination passenger and cargo ship; majority steam-turbine propelled (several modified types).
9	C3–S	12, 300	Designed for cargo; steam-turbine propelled.
10	C4	15, 000	Designed for cargo; steam-turbine propelled (two modifications).
11	C4–S–1a	12, 900	Mariner class vessel. Developed by Maritime Administration in cooperation with the Department of Defense to provide modern high-speed commercial-type vessels that can readily be converted for wartime shipping.
12	EC2	10, 800	Liberty type designed for general cargo; steam-reciprocating-engine propelled. Several modified types, prefixed by the symbol Z, were designed as tank carriers and later modified as aircraft carriers.
13	L6	15, 700	Specially designed for bulk ore, coal, or grain trade on the Great Lakes; steam-reciprocating-engine propelled.
14	N3	2, 800	Cargo carrier designed for coastal trade; steam-reciprocating-engine propelled.
15	P1	1, 900	Specially designed passenger-type vessel; steam-turbine propelled.
16	P2	10, 000–12, 000	Designed to carry troops. Two types, one turbine-electric propelled, one steam-turbine propelled.
17	T1	1, 500–4, 200	Designed for tanker service in coastal and inland waters; diesel propelled (four modifications).
18	T2	16, 000	Designed to carry bulk oil in world trade; turboelectric propelled (four modifications).
19	T3	16, 500	Designed to carry bulk oil in world trade; steam-turbine propelled (six modifications).
20	V4	800	Large diesel-powered oceangoing tug.
21	VC2	10, 200	Victory type designed to carry cargo in world trade. Four types: one has 6,000-hp engine; three have 8,500-hp engines. Three are steam-turbine propelled; one diesel propelled.
22	FAMF	*16, 000	Converted Navy seaplane tender for floating aircraft maintenance facility (FAMF). Limited supply support, for the operation and maintenance of Army aircraft.

*Displacement tonnage.

7-35 comprise the majority of all shipping available for military use. Note that the ships' capacities are expressed in LTON to conform with normal shipping procedures, whereas the discharge and loading capabilities of transportation terminal service companies are expressed in STON to conform with practices of other means of transportation.

Table 7-29. Physical Characteristics of Vessels

1	Vessel	Gross register tonnage	Overall length (m (ft))	Beam (ft)	Sustained speed (knots)	Cruising range (nautical miles)	Summer draft (m (ft))
2	Liberty	7, 100	135 (442)	57	11.0	[a] 9, 000	8.5 (28)
3	Victory	7, 600	139 (455)	62	15.5	23, 000	8.8 (29)
4	C1-B cargo	6, 700	127 (418)	60	14.0	24, 000	8.5 (28)
5	C2 cargo	6, 181	140 (459)	63	15.0	16, 000	7.9 (26)
6	C3 cargo	7, 900	150 (492)	70	16.5	11, 700	8.8 (29)
7	C4 cargo	10, 780	158 (520)	71	17.0	9, 000	10.0 (33)
8	FS freighter [b]	560	154 (176)	32	12.0	4, 000	3.6 (12)
9	C1-M-AV1 freighter	3, 805	103 (339)	50	11.0	25, 000	6.4 (21)
10	T2-SE tanker	10, 200	160 (524)	68	14.5	12, 600	9.1 (30)
11	ZET-1 tanker [c]	7, 000	135 (442)	57	11.0	17, 000	8.5 (28)
12	C4 Mariner	9, 200	172 (564)	76	20.0	23, 000	9.1 (30)
13	FAMF	1, 124	164 (538)	69	18.0	----------	7.0 (23)

[a] Cruising range can he increased to 18,000 miles if deep tanks are used for fuel oil. See footnote h in tahie 7-31.

[b] FS type (freight service ship) is the 176-foot vessel huilt for the Army. It is an oceangoing vessel hut, hecause of its small capacity, is used principally as an interisland carrier.

[c] Converted Liberty.

Table 7-30. Hold, Hatch, and Boom Data

1	Vessel	Cargo holds (number)	Boom capacity (LTON)	Booms (number)	Capacity heavy lift rigs (LTON)	Hatches with heavy lift booms (numher)
2	Liberty	5	5	12	[a] 50-15	2-4
3	Victory	5	5	16	[a] 50-30	[a] 3-4
4	C1-B cargo	5	5	15	30	2
5	C2 cargo	5	5	17	50	3
6	C3 cargo	5	5-10	21	30	5
7	C4 cargo	7	5	24	50	4-5
8	FS freighter [b]	2	5	5	15	2
9	C1-M-AV1 freighter	4	[c] 3-5	12	30	2-3
10	C4 Mariner	7	5-10	26	60	4-6

[a] Some Lihertys have a 30-ton boom at No. 2 hatch and a 15-ton boom at No. 4 hatch. Other Liberty ships have a 50-ton boom at No. 2 hatch and a 30-ton boom at No. 4 hatch. All Victorys have a 30-ton boom at No. 4 hatch.

[b] FS typo (freight service ship) is the 176-foot vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

[c] Two 3-ton booms (No. 4 hatch) and ten 5-ton booms.

Table 7-31. Vessel Capacities

1	Vessel	2 Deadweight (LTON)	3 MTON [a] [b]	4 Bale cubic capacity (cu ft) [a] [b]	5 Grain cubic capacity (cu ft) [a]	6 Reefer cargo (cu ft)	7 Liquid cargo (bbl)
2	Liberty	10,800	11,886	475,444	563,257		
3	Victory	10,800	11,413	456,525	528,325		
4	C1-B cargo	9,100	11,300	452,000	508,000		
5	C2 cargo	9,250	11,823	472,935	548,560		
6	C3 cargo	12,300	18,425	736,980	815,470	[c] 45,000	
7	C4 cargo	14,863	17,790	672,240	727,430	[d] 32,375	
8	FS freighter	470	483	19,320	21,462		
9	C1-M-AV1 freighter	5,032	5,699	227,930	250,000	9,830	4,000
10	T2-SE tanker	16,583	381	15,230			141,000
11	ZET-1 tanker [e]	10,800					65,000
12	Supertanker [f]	25,000					165,000
13	C4 Mariner	12,900	18,418	736,723	837,305	30,254	

[a] On-deck space or lost space in stowage not included.

[b] Does not include capacity of deep tanks, of which the Liberty-type ship has 3. Deep tanks No. 1 and No. 2, with approximately 16,000 cubic feet of capacity, may be used for dry or liquid cargoes if not in use for vessel voyage requirements. No. 3 deep tank is rigged for either fuel oil or bulk cargo liquids. A 5,000-barrel (703 LTON) payload can be shipped in this tank if the contemplated voyage is to be short enough that No. 3 tank will not be needed for fuel oil.

[c] Standard C3 has no refrigerated cargo capacity; figure given is for C3 passenger and cargo type.

[d] Standard C4 has no refrigerated cargo capacity; figures given are for C4-S-A4 type.

[e] Modified Liberty.

[f] Supertankers are those tankers of more than 25,000 dwt, which run up to 100,000 dwt or more.

Table 7-32. Detailed Capacities Below Deck

1	Vessel	2 Hatch number	3 Hatch dimensions	4 Cargo capacities (MTON) Upper 'tween	Lower 'tween	Hold	Deep tanks
2	C1-B	1	29 ft 3 in. by 20 ft	481	398	862	
		2	31 ft 6 in. by 20 ft	750	742	1,438	
		3	31 ft 6 in. by 20 ft	845	779	1,222	
				[a] 102			
		4	31 ft 6 in. by 20 ft	780	1,229		480
		5	31 ft 6 in. by 20 ft	574	608		
	Total			3,532	3,756	3,522	480
3	C1-M-AV1	1	20 ft 1½ in. by 19 ft 11 in		601	616	
		2	40 ft 5 in. by 19 ft 11 in		982	1,378	
		3	40 ft 5 in. by 19 ft 11 in		901	1,179	
		4	9 ft by 8 ft		[b] 169	113	
	Total				2,653	3,286	
4	C2-S-AJ	1	26 ft 10 in. by 19 ft 10 in	602	519	947	
		2	32 ft 4 in. by 19 ft 10 in	804	805	1,405	
		3	34 ft 10 in. by 19 ft 10 in	908	968	1,514	
		4	29 ft 10 in. by 19 ft 10 in	902	932	1,483	
		5	29 ft 10 in. by 19 ft 10 in	722		1,056	
	Total			3,938	3,224	6,405	
5	EC2 (Liberty)	1	33 ft 7 in. by 19 ft 10 in		983	902	416
		2	34 ft 10 in. by 19 ft 10 in		1,065	2,300	
		3	19 ft 10 in. by 19 ft 10 in		597	1,495	613
		4	34 ft 10 in. by 19 ft 10 in		742	1,315	
		5	34 ft 10 in. by 19 ft 10 in		771	1,290	
	Total				4,158	7,302	1,029

See footnotes at end of table.

Table 7-32. Detailed Capacities Below Deck—Continued

1	1 Vessel	2 Hatch number	3 Hatch dimensions	4 Cargo capacities (MTON) Upper 'tween	5 Lower 'tween	6 Hold	7 Deep tanks
6	VC2 (Victory)	1	24 ft 11 in. by 22 ft 3 in	551	595	698	--------
		2	23 ft 11 in. by 22 ft 3 in	675	545	698	--------
		3	35 ft 11 in. by 22 ft 3 in	1, 139	945	1, 321	--------
		4	35 ft 11 in. by 22 ft 3 in	1, 230	----------	1, 277	--------
		5	23 ft 11 in. by 22 ft 3 in	1, 091	----------	648	--------
	Total			4, 686	2, 085	4, 642	--------
7	C3-S-A2	1	35 ft 9½ in. by 19 ft 9½ in	812	1, 130	1, 079	--------
		2	29 ft 9½ in. by 23 ft 9½ in	830	1, 381	1, 396	--------
		3	37 ft 3½ in. by 23 ft 9½ in	1, 244	1, 553	2, 002	--------
		4	29 ft 9½ in. by 23 ft 9½ in	1, 164	1, 255	1, 419	--------
		5	39 ft 9½ in. by 23 ft 9½ in	1, 009	1, 704	212	--------
	Total			5, 059	7, 023	6, 108	--------
8	C4-S-A4	1	17 ft 9 in. by 16 ft 8 in	[c] 496	[d] 340	141	--------
		2	26 ft 10 in. by 17 ft 9 in	[c] 1, 139	[d] 1, 258	772	--------
		3	26 ft 10 in. by 17 ft 9 in	798	651	--------	[e] 1, 084
		4	26 ft 10 in. by 17 ft 9 in	803	[d] 1, 533	994	--------
		5	26 ft 10 in. by 17 ft 9 in	765	[d] 1, 515	1, 017	--------
		6	26 ft 10 in. by 17 ft 9 in	795	782	1, 636	--------
		7	17 ft 9 in. by 17 ft 1 in	[f] 583	[f] 454	----------	----------
	Total			5, 379	6, 533	4, 560	1, 084
9	C4-S-B5	1	20 ft by 18 ft	608	293	----------	----------
		2	27 ft 6 in. by 20 ft	1, 160	1, 128	704	--------
		3	27 ft 6 in. by 20 ft	702	641	603	837
		4	30 ft by 20 ft	[g] 1, 626	764	1, 047	--------
		5	30 ft by 20 ft	[g] 1, 623	772	1, 055	--------
		6	30 ft by 20 ft	[g] 1, 540	794	998	--------
		7	20 ft 3 in. by 18 ft	95	482	358	--------
	Total			7, 354	4, 874	4, 765	837
10	C4-S-1a (Mariner)	1	19 ft 6 in. by 17 ft 9 in	402	453	305	--------
		2	29 ft 10 in. by 23 ft 10 in	731	865	637	--------
		3	39 ft 10 in. by 29 ft 10 in	1, 050	1, 454	1, 284	--------
		4	39 ft 10 in. by 29 ft 10 in	1, 006	1, 500	1, 528	--------
		5	39 ft 10 in. by 29 ft 10 in	1, 044	410	401	953
		6	39 ft 10 in. by 29 ft 10 in	965	----------	1, 646	298
		7	29 ft 10 in. by 24 ft 10 in	1, 627	----------	856	--------
	Total			6, 825	4, 682	6, 657	1, 251
11	FS freighter	1	20 ft by 16 ft	----------	----------	251	--------
		2	28 ft by 16 ft	----------	----------	285	--------
	Total			----------	----------	536	--------

[a] Special cargo locker on upper 'tween level between hatches No. 3 and 4.
[b] Includes 36 MTON in trunked hatch.
[c] Includes upper deck and second deck.
[d] Includes third deck and first platform.
[e] Liquid cargo space.
[f] Includes refrigerated cargo space.
[g] Includes main 'tween deck.

Table 7-33. Deadweight Tonnage

1	Vessel	Maximum ship-operating supplies* (LTON)	Cargo capacity tonnage when operating supplies (LTON) are maximum*	Total (LTON)
2	Liberty	2, 800	8, 000	10, 800
3	Victory	3, 100	7, 500	10, 600
4	C1-B	1, 850	7, 250	9, 100
5	C1-M-AV1	1, 047	6, 393	7, 440
6	Mariner	4, 065	9, 353	13, 418

*Operating supplies include fuel, water, dunnage, and ship stores. Additional payload capacity may be substituted to a limited extent depending on length of voyage and type of cargo, which will warrant a reduction in such ship-operating supplies.

7-48. Approximate Sailing Distances in Nautical Miles

Table 7-36 provides nautical-mile sailing distances from various U.S. ports to other U.S. ports and to ports throughout the world.

7-49. Shipping Turnaround Times

a. General. Turnaround time for similar-type ships seldom is the same between two ports, or other equidistant runs, unless sailings are carefully controlled. Assuming controlled operating conditions, a basis for turnaround times can be established for typical ships (troop or cargo) for general planning purposes.

b. Turnaround Time Components. Turnaround time components are—

(1) Loading time at home port.

(2) Steaming time to and from destination.

(3) Unloading and loading time at destination.

(4) Unloading time at home port.

(5) Normal voyage repair and reoutfitting time.

c. Planning Factors.

(1) *Sailing distances per day.**

(*a*) *Cargo ships.*

1. Slow—240 nautical miles.

2. Fast—360 nautical miles.

(*b*) *Passenger ships.*

1. Slow—360 nautical miles.

2. Fast—432 nautical miles.

(2) *Time in ports per round trip for unloading, loading, voyage repairs, and reoutfitting.*

(*a*) Cargo ships—35 days.

(*b*) Troop ships—20 days.

(*c*) Tankers—10 days.

(3) *Convoys and effect on turnaround time.* A major portion of shipping may be conducted in convoy formation, the speed of which is dictated by the slowest vessel in each convoy. The planner must consider this factor in computing turnaround time for convoy or *escorted* shipping.

(4) *Convoy sailing times.* Table 7-37 provides convoy sailing times (in days) from various U.S. ports to other U.S. ports and to ports throughout the world.

*For convoy sailing speed of advance, deduct 10 percent for delays in forming convoys, zigzagging en route, etc. The 10-percent loss factor is not applicable to ships in the "fast" category since such ships will normally proceed individually.

Table 7-34. Vehicle Loading Capacities of Vessels

1	Vessel	2	3	4	5	6	7	8	9	10	11
		Trucks, utility ¼-ton, 4x4 [a]		Trailers, cargo, 1½-ton 2-wheel [a]		Trucks, cargo, ¾-ton 2-wheel [a]		Trucks, cargo, 2½-ton, 6x6, LWB		Trucks, cargo, 5-ton, 6x6, LWB	
		On wheels	Crated [b]	On wheels	Crated [b]	On wheels	Crated [b]	On wheels	Crated [b]	On wheels	Crated [b] [c]
2	Liberty	498	2, 078	404	4, 493	312	744	[d] 185	357	102	
3	Victory	512	1, 983	512	4, 287	331	710	193	340	114	
4	C1-B	511	1, 912	491	4, 133	337	684	182	328	145	
5	C1-M-AV1	314	645	261	456	167	280	111	114	61	
6	Mariner	1, 181	1, 740	891	1, 732	665	966	364	328	229	

[a] Double the number of ¼-ton trucks on wheels can be stowed if they are stacked. It also is estimated that at least 35-percent more 1½-ton trailers can be loaded if stowed in tandem with drawbar nested inside body of preceding trailer, provided tailgates are drop type. Regarding the other three types of vehicles, more can be stowed in the Liberty ship by double-decking; see footnote b, table 7-35.

[b] All crated vehicles are boxed by single units except the 1½-ton trailers, which are boxed by twin units.

[c] The 5-ton truck, M54, is not shipped crated.

[d] 153 ¼-ton trucks may be loaded in the bodies of 153 of these trucks. The other 32 trucks will not take jeeps because of the limiting height of the compartments in which stowed. As an alternative, a total of 215 trucks can be stowed by double-decking in No. 2 and 3 holds.

Table 7-35. Detailed Vehicle Loading Capacities (Stowed on Wheels) of Vessels

1	1	2	3	4	5	6	7
1	Hatch number	Location	Trucks, utility, ¼-ton 4x4	Trailers, cargo, 1½-ton 2-wheel	Trucks, cargo, ¾-ton, 4x4	Trucks, cargo, 2½-ton, LWB	Trucks, cargo, 5-ton, 6x6 LWB
		Liberty ship					
2	1	'Tween deck	28	27	23	12	8
3	-------	Lower hold	28	24	18	10	5
4	-------	On deck	22	22	14	9	6
5	2	'Tween deck	54	44	[a] 30	21	12
6	-------	Lower hold	48	42	[a] 30	[a] 18	12
7	-------	On deck	41	36	20	13	8
8	3	'Tween deck	36	28	25	14	6
9	-------	Lower hold	32	28	22	[a] 12	6
10	-------	On deck	22	14	10	6	4
11	4	'Tween deck	41	37	27	16	8
12	-------	Lower hold	20	15	18	10	2
13	-------	On deck	31	20	16	11	8
14	5	'Tween deck	44	34	25	16	9
15	-------	Lower hold	20	11	20	6	2
16	-------	On deck	31	22	14	11	6
		Victory ship					
17	1	Upper 'tween deck	15	16	9	5	0
18	-------	Lower 'tween deck	16	18	9	6	3
19	-------	Hold	15	13	8	4	3
20	-------	On deck	14	12	6	5	4
21	2	Upper 'tween deck	29	26	17	10	4
22	-------	Lower 'tween deck	25	24	17	10	5
23	-------	Hold	21	21	14	8	3
24	-------	On deck	18	16	12	7	4
25	3	Upper 'tween deck	48	48	29	17	12
26	-------	Lower 'tween deck	46	46	30	18	12
27	-------	Hold	44	46	30	18	8
28	-------	On deck	25	29	18	13	8
29	4	'Tween deck	49	48	34	16	14
30	-------	Hold	49	49	31	18	13
31	-------	On deck	23	25	18	13	8
32	5	'Tween deck	30	31	20	12	6
33	-------	Hold	20	19	12	7	3
34	-------	On deck	25	25	17	6	4
		C1-B[b]					
35	1	Upper 'tween deck	21	18	12	6	4
36	-------	Lower 'tween deck	21	18	12	6	5
37	-------	Lower hold	14	13	9	4	4
38	-------	On deck	14	14	12	5	7
39	2	Upper 'tween deck	46	37	25	13	12
40	-------	Lower 'tween deck	42	37	25	15	12
41	-------	Lower hold	34	36	21	13	11
42	-------	On deck	25	21	18	12	7
43	3	Upper 'tween deck	44	42	30	17	12
44	-------	Lower 'tween deck	41	42	28	13	12
45	-------	Lower hold	41	42	28	13	9
46	-------	On deck	23	21	14	10	5
47	4	Upper 'tween deck	39	41	26	14	12
48	-------	Lower 'tween deck	36	37	24	12	10
49	-------	On deck	21	21	14	10	7

See footnotes at end of table.

Table 7-35. Detailed Vehicle Loading Capacities (Stowed on Wheels) of Vessels—Continued

1	1 Hatch number	2 Location	3 Trucks, utility, ¼-ton 4x4	4 Trailers, cargo, 1½-ton 2-wheel	5 Trucks, cargo, ¾-ton, 4x4	6 Trucks, cargo, 2½-ton, LWB	7 Trucks, cargo, 5-ton, 6x6 LWB
		C1-B[b]					
50	5	'Tween deck	23	23	15	7	5
51	----	Hold	10	10	12	6	6
52	----	On deck	16	18	12	7	5
		C1-M-AV1[c]					
53	1	'Tween deck	30	23	16	10	3
54	----	Hold	16	13	7	4	2
55	----	On deck	20	14	13	7	4
56	2	'Tween deck	51	46	28	19	10
57	----	Hold	51	45	28	19	10
58	----	On deck	30	24	18	10	8
59	3	'Tween deck	44	37	27	17	9
60	----	Hold	44	37	26	15	9
61	----	On deck	28	22	14	10	6
		Mariner					
62	1	Upper 'tween deck	20	16	12	6	4
63	----	Lower 'tween deck	14	10	9	4	0
64	----	Hold	9	5	6	3	0
65	----	On deck	20	20	11	7	4
66	2	Upper 'tween deck	37	23	22	11	7
67	----	Lower 'tween deck	26	21	15	9	7
68	----	Hold	15	11	9	5	2
69	----	On deck	33	23	20	10	7
70	3	Upper 'tween deck	61	48	38	25	13
71	----	Lower 'tween deck	52	44	32	21	13
72	----	Hold	36	32	22	14	9
73	----	On deck	52	42	30	20	10
74	4	Upper 'tween deck	69	46	38	20	14
75	----	Lower 'tween deck	69	46	38	20	14
76	----	Hold	56	44	30	16	12
77	----	On deck	52	36	26	18	10
78	5	Upper 'tween deck	72	56	42	18	14
79	----	Lower 'tween deck	74	58	44	[d]18	[d]14
80	----	Hold	72	56	42	[d]16	[d]12
81	----	Deep tank	36	28	14	6	2
82	----	On deck	54	36	28	20	12
83	6	'Tween deck	65	47	36	18	14
84	----	Hold	34	30	20	12	9
85	----	Deep tank	10	4	0	0	0
86	----	On deck	54	40	30	20	12
87	7	'Tween deck	42	33	23	11	7
88	----	Hold	10	9	6	4	0
89	----	On deck	37	27	22	12	7

[a] Based on *no* centerline bulkhead, which may not be standard equipment.

[b] Number of vehicles (except 5-ton, 6X6) in lower holds of No. 2 and 3 hatches can be doubled by flooring over one layer of vehicles and loading a second layer directly on top. The depth of only these two holds will permit such double-decking.

[c] No. 4 hatch is not large enough for vehicle loading.

[d] On nonrefrigerated type only. Approximately three 5-tons or four 2½-tons can be loaded on these decks on refrigerated-type vessels.

Table 7-36. Approximate Sailing Distances in Nautical Miles

1	1 Ports	2	3	4	5	6	7	8
		Ports of embarkation						
		Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
	United States							
2	Boston		200	900	2,000	[a] 5,100	[a] 5,400	[a] 6,200
3	New York	200		600	1,700	[a] 4,900	[a] 5,300	[a] 6,000
4	Charleston	900	600		1,220	[a] 4,500	[a] 4,900	[a] 5,600
5	New Orleans	2,000	1,700	1,200		[a] 4,300	[a] 4,700	[a] 5,500
6	Los Angeles	[a] 5,100	[a] 4,900	[a] 4,500	[a] 4,300		400	1,100
7	San Francisco	[a] 5,400	[a] 5,300	[a] 4,900	[a] 4,700	400		800
8	Seattle	[a] 6,200	[a] 6,000	[a] 5,600	[a] 5,500	1,100	800	
	North Atlantic							
9	Newfoundland, St. John's	900	1,100	1,700	2,600	[a] 5,700	[a] 6,000	[a] 6,800
10	Greenland, Ivigtut	1,700	1,900	2,400	3,400	[a] 6,500	[a] 6,800	[a] 7,600
11	Iceland Reykjavik	2,300	2,500	3,000	4,000	[a] 7,100	[a] 7,400	[a] 8,200
	Europe							
	United Kingdom:							
12	Liverpool	3,000	3,200	3,700	4,700	[a] 7,600	[a] 7,900	[a] 8,700
13	Southampton	3,000	3,200	3,600	4,600	[a] 7,500	[a] 7,800	[a] 8,600
14	Northern Ireland, Belfast	2,900	3,000	3,400	4,400	[a] 7,200	[a] 7,500	[a] 8,300
15	Norway, Oslo	3,900	4,100	4,400	5,300	[a] 8,200	[a] 8,600	[a] 9,400
	Russia:							
16	Archangel	4,000	4,200	4,800	5,800	[a] 8,800	[a] 9,200	[a] 10,000
17	Murmansk	3,700	3,800	4,400	5,400	[a] 8,500	[a] 8,900	[a] 9,700
	France:							
18	Le Harve	3,000	3,200	3,600	4,600	[a] 7,500	[a] 7,800	[a] 8,600
19	Brest	2,900	3,100	3,500	4,500	[a] 7,400	[a] 7,700	[a] 8,500
20	Bordeaux	3,000	3,200	3,700	4,700	[a] 7,600	[a] 7,900	[a] 8,700
21	Belgium, Antwerp	3,200	3,400	3,800	4,800	[a] 7,700	[a] 8,000	[a] 8,800
	Mediterranean							
22	France, Marseille	[b] 3,700	[b] 3,900	[b] 4,300	[b] 5,300	[a] 8,000	[a] 8,200	[a] 9,000
23	Italy, Naples	[b] 4,000	[b] 4,200	[b] 4,600	[b] 5,600	[a] 8,300	[a] 8,500	[a] 9,300
24	Algeria, Algiers	[b] 3,400	[b] 3,600	[b] 4,000	[b] 5,000	[a] 7,700	[a] 8,000	[a] 8,800
25	Strait of Gibraltar	3,000	3,200	3,600	4,600	[a] 7,300	[a] 7,500	[a] 8,300
	Caribbean and South Atlantic							
26	Bermuda, Hamilton	700	700	800	1,700	[a] 4,600	[a] 4,900	[a] 5,800
27	Puerto Rico, San Juan	1,500	1,400	1,100	1,500	[a] 8,900	[a] 4,300	[a] 5,100
28	Trinidad, Port of Spain	2,000	1,900	1,700	2,100	[a] 4,100	[a] 4,400	[a] 5,300
29	Brazil, Rio de Janeiro	4,700	4,800	4,700	5,200	[a] 7,200	[a] 7,600	[a] 8,400
30	Argentina, Buenos Aires	5,800	5,900	5,800	6,300	[a] 8,300	[a] 8,700	[a] 9,600
31	Panama Canal, Panama	2,200	2,000	1,600	1,400	2,900	[a] 3,200	[a] 4,000
	Middle East							
32	Egypt, Port Said	[b] 4,900	[b] 5,100	[b] 5,500	[b] 6,500	[a] 9,200	[a] 9,500	[a] 10,300
33	Arabia, Aden	[b] 6,300	[a] 6,500	[b] 6,900	[b] 7,900	[a] 10,600	[a] 10,900	[a] 11,700
34	Turkey, Istanbul	[b] 4,800	[b] 5,000	[b] 5,400	[b] 6,400	[a] 9,100	[a] 9,400	[a] 10,200
35	Iran, Khorramshahr (Persian Gulf)	[b] 8,300	[b] 8,500	[b] 8,900	[b] 9,800	[a] 12,600	[a] 12,900	[a] 13,700

See footnotes at end of table.

Table 7–36. Approximate Sailing Distances in Nautical Miles—Continued

1	1 Ports	2	3	4	5	6	7	8
		Ports of embarkation						
		Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
	North Pacific							
36	Alaska, Dutch Harbor	[a] 7, 400	[a] 7, 300	[a] 6, 900	[a] 6, 700	[a] 2, 400	2, 100	1, 700
37	East Russia, Vladivostok	[a] 9, 500	[a] 9, 300	[a] 8, 900	[a] 8, 700	5, 000	4, 600	4, 400
	Middle Pacific							
38	Hawaiian Islands, Honolulu	[a] 6, 900	[a] 6, 700	[a] 6, 300	[a] 6, 100	2, 200	2, 100	2, 400
39	Marshall Islands, Kwajalein	[a] 9, 200	[a] 9, 000	[a] 8, 600	[a] 8, 400	4, 200	4, 400	4, 500
40	Mariana Islands, Guam	[a] 10, 200	[a] 10, 000	[a] 9, 600	[a] 9, 400	5, 600	5, 100	4, 900
41	Japan, Yokohama	[a] 9, 900	[a] 9, 600	[a] 9, 500	[a] 9, 100	4, 800	4, 500	4, 200
	Southwest Pacific							
42	New Guinea, Finschhafen	[a] 10, 200	[a] 10, 000	[a] 9, 600	[a] 9, 400	6, 100	5, 900	6, 000
43	Philippine Islands, Manila	[a] 11, 600	[a] 11, 300	[a] 11, 000	[a] 10, 800	6, 600	6, 300	6, 100
	Australia:							
44	Brisbane	[a] 9, 900	[a] 9, 600	[a] 9, 300	[a] 9, 100	6, 300	6, 200	6, 500
45	Melbourne	[a] 10, 100	[a] 9, 900	[a] 9, 500	[a] 9, 400	7, 000	7, 000	7, 300
46	Malaya, Singapore	[b] 9, 900	[a] 10, 100	[b] 10, 500	[b] 11, 500	7, 900	7, 500	7, 100
	China-Burma-India							
	China:							
47	Shanghai	[a] 10, 800	[a] 10, 600	[a] 10, 200	[a] 10, 000	5, 700	5, 400	5, 100
48	Hong Kong	[a] 11, 400	[a] 11, 200	[a] 10, 800	[a] 50, 600	6, 400	6, 000	5, 700
	India:							
49	Bombay	[b] 8, 000	[b] 8, 200	[b] 8, 600	[b] 9, 500	[a b] 12, 200 10, 300	[a b] 12, 600 9, 600	[a b] 13, 400 9, 500
50	Calcutta	[b] 9, 600	[b] 9, 800	[b] 10, 200	[b] 11, 200	[a b] 13, 900 9, 500	[a b] 14, 200 9, 100	[a b] 15, 000 8, 700
51	Burma, Rangoon	[b] 9, 600	[b] 9, 800	[b] 10, 200	[b] 11, 200	[a b] 13, 900 9, 000	[a b] 14, 200 8, 600	[a b] 15, 000 8, 200
	Southeast Asia							
52	Thailand, Bangkok	[a] 10, 600	[a] 10, 400	[a] 10, 000	[a] 9, 800	7, 900	7, 500	7, 100
	South Vietnam:							
53	Saigon	[a] 10, 400	[a] 10, 300	[a] 9, 800	[a] 9, 600	7, 300	6, 900	6, 500
54	Cam Ranh Bay	[a] 10, 300	[a] 10, 100	[a] 9, 700	[a] 9, 500	7, 100	6, 700	6, 300
55	Da Nang	[a] 10, 400	[a] 10, 200	[a] 9, 800	[a] 9, 600	6, 900	6, 500	6, 100

[a] Via Panama Canal.
[b] Via Strait of Gibraltar.

Table 7-37. Convoy Sailing Times (Days)

1	Ports	Ports of embarkation [1]													
		Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle	
		Type of shipping													
		Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo
	United States														
2	Boston									48	72	50	74	54	82
3	New York									46	70	49	74	53	80
4	Charleston									45	67	47	71	51	77
5	New Orleans									44	67	46	69	51	77
6	Los Angeles	48	72	46	70	45	67	44	67						
7	San Francisco	50	74	49	74	47	71	46	69						
8	Seattle	54	82	53	80	51	77	51	77						
	North Atlantic														
9	Newfoundland, St. John's			27	40	30	45	36	53	55	82	57	85	61	92
10	Greenland, Ivigtut	30	45	31	47	35	52	41	61	60	89	62	92	66	100
11	Iceland, Reykjavik	34	50	35	52	38	57	44	67	63	95	65	97	70	106
	Europe														
	United Kingdom:														
12	Liverpool	38	57	39	59	43	64	49	73	66	100	68	102	73	110
13	Southampton	38	57	39	59	42	63	48	72	66	99	68	102	72	109
14	Northern Ireland, Belfast	38	56	38	57	41	61	47	70	64	96	66	99	71	106
15	Norway, Oslo	44	66	45	68	47	70	52	78	70	105	72	109	77	116
	Russia:														
16	Archangel	44	67	46	69	49	74	55	83	73	111	76	114	81	122
17	Murmansk	43	64	43	65	47	70	53	80	72	108	74	112	79	119
	France:														
18	Le Havre	38	57	39	59	42	63	48	72	66	99	68	102	72	109
19	Brest	38	56	39	58	41	62	48	71	65	97	67	101	72	108
20	Bordeaux	38	57	39	59	43	64	49	73	66	100	68	102	73	110
21	Belgium, Antwerp	39	59	41	61	43	65	49	74	67	101	69	103	73	111
	Mediterranean														
22	France, Marseille	43	64	44	66	46	69	52	78	69	103	70	106	75	113
23	Italy, Naples	44	67	46	69	48	72	54	81	71	106	72	108	77	115
24	Algeria, Algiers	41	61	42	63	44	67	50	76	67	101	69	103	73	111
25	Strait of Gibraltar	38	57	39	59	42	63	48	72	65	97	66	99	71	106
	Caribbean and South Atlantic														
26	Bermuda, Hamilton							30	45	48	72	50	75	55	83
27	Puerto Rico, San Juan	29	44	28	42	27	40	29	44	44	66	46	69	50	76
28	Trinidad, Port of Spain	32	48	31	47	30	45	33	49	45	68	47	70	52	78
29	Brazil, Rio de Janeiro	49	73	49	74	49	73	51	78	64	96	66	100	71	107
30	Argentina, Buenos Aires	55	83	56	84	55	83	59	88	71	106	73	110	78	118
31	Panama, Panama Canal	33	48	32	48	30	45	28	42	38	56	39	59	44	67

See footnote at end of table.

Table 7–37. Convoy Sailing Times (Days)—Continued

1	1 Ports	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Ports of embarkation [1]													
		Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle	
		Type of shipping													
		Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo
	Middle East														
32	Egypt, Port Said	50	75	50	76	54	80	60	89	76	114	78	117	83	124
33	Arabia, Aden	51	78	60	89	62	93	68	102	85	127	86	130	92	137
34	Turkey, Istanbul	49	74	50	76	53	80	59	89	76	113	77	116	82	124
35	Iraq, Basra	71	106	72	108	73	110	80	120	97	145	99	147	104	155
	North Pacific														
36	Alaska, Dutch Harbor	65	97	65	97	62	93	61	91	35	52	33	49	30	45
37	East Russia, Vladivostok	78	117	77	115	74	112	73	110	50	76	48	72	47	70
	Middle Pacific														
38	Hawaiian Islands, Honolulu	62	93	61	91	59	88	57	86	33	48	33	49	35	52
39	Marshall Islands, Kwajalein	76	114	75	113	72	109	71	107	46	69	47	70	48	71
40	Marianas, Guam	82	124	81	122	78	118	77	116	54	81	50	76	50	75
41	Japan, Yokohama	80	121	79	118	78	117	76	113	49	74	48	71	46	69
	Southwest Pacific														
42	New Guinea, Finschhafen	82	124	81	122	78	118	77	116	57	86	56	84	57	85
43	Philippines, Manila	91	136	89	133	87	131	86	129	60	90	59	88	57	86
	Australia:														
44	Brisbane	80	121	78	118	77	115	76	113	59	88	58	87	60	89
45	Melbourne	82	123	80	121	78	117	77	116	62	94	62	94	65	97
46	Malaya, Singapore	80	121	82	123	83	126	90	134	68	102	66	99	63	95
	China-Burma-India														
	China:														
47	Shanghai	86	129	85	127	82	124	81	122	55	82	53	80	50	76
48	Hong Kong	90	135	88	132	86	129	85	127	59	89	57	85	55	82
	India:														
49	Bombay	69	103	70	106	72	109	78	117	94	142	97	145	102	153
										83	124	80	121	78	117
50	Calcutta	79	118	80	120	82	124	88	132	105	157	108	160	112	167
										78	117	76	113	73	110
51	Burma, Rangoon	79	118	80	120	82	124	88	132	165	157	108	160	112	167
										75	113	72	109	70	106
	Southeast Asia														
52	Thailand, Bangkok	85	132	84	130	82	125	79	125	66	108	65	103	64	102
	South Vietnam:														
53	Saigon	84	130	83	128	79	125	78	123	64	102	63	99	60	94
54	Cam Rahn Bay	84	130	82	127	77	123	77	123	64	102	62	97	58	92
55	Da Nang	84	130	83	128	79	125	78	123	63	99	60	94	57	90

[1] All turnaround times are based on the routes indicated in table 7–36 (para 7–48) and on data given in paragraph 7–49c above. The turnaround times between ports, with the exception of inter-U.S. port times, include a 10-percent safety factor for forming convoy, zigzagging, etc.

Section X. MISCELLANEOUS TRANSPORT

7-50. General

Other means of transportation are relatively less important than pipeline, water, rail, highway, and air transportation in the overall picture of transportation. However, all these other means have peculiar characteristics that are adaptable to special situations, as indicated in paragraphs 7-51 through 7-53. For this reason planners should not underestimate their value.

7-51. Pack Animals

a. Employment. Pack mules may be employed to transport light cargo over terrain that is impassable for motor transport.

b. Characteristics and Capabilities. Characteristics and capabilities of pack animals are as follows:

(1) Height—59 to 62 inches.
(2) Weight—1,000 to 1,200 pounds.
(3) Rate of march—2.5 kilometers per hour average.
(4) Cargo load—200 to 250 pounds.
(5) Movement of casualties—one litter or two sitting casualties.
(6) Forage—10 pounds of oats and 14 pounds of hay per day.

May be reduced for short periods up to 10 days without impairing capability.

(7) Water—10 gallons per day.
(8) Average daily distance.
  (*a*) Mountainous terrain—19 kilometers.
  (*b*) Rolling or flat terrain—35 kilometers.
(9) Gradability.
  (*a*) Rate of ascent—500 vertical meters per hour.
  (*b*) Rate of descent—300 vertical meters per hour.
(10) Noneffective rate—32 per 1,000 mules.

c. Transportability. Table 7-38 provides transportability data for pack animals.

d. Horse-Drawn Carts. Horse-drawn carts are capable of traveling 32 kilometers in the day and sustaining a payload of 1,000 pounds.

7-52. Sled Trains

a. General. A sled train furnishes oversnow and overice movement of supplies, equipment, and personnel. Sled trains are employed when more efficient means of transportation are not feasible.

Table 7-38. Transportability Pack Animals

	1	2
1	Vehicle	Capacity (horses or mules)
2	Truck, 1½-ton, cargo	2.
3	Truck, 2½-ton, cargo, 6x6	4.
4	Semitrailer, 6-ton, combination animal and cargo.	8.
5	Railroad stock car, 40-ft	25 (approx).
6	Railroad stock car, 36-ft	20 to 22 (approx).
7	Airplane, transport*	4 to 6.

*May be transported at altitudes up to 18,000 feet with no ill effects.

b. Planning Factors.

(1) *Capacity of cargo transporters.*

(*a*) Sled, 10-ton (OTACO)—bed dimensions, 8 feet by 20 feet; capacity, 20,000 pounds.

(*b*) Sled, 20-ton (OTAGO)—bed dimensions, 12 feet by 24 feet; capacity, 40,000 pounds.

(*c*) Transporter, cargo, large-wheel, off-road (Thompson trailer)—main cargo bed dimensions (with side extensions), 12 feet by 13 feet; rear-axle cargo well, two usable cargo areas, each 4 feet by 4 feet, separated by rear axle; capacity, 20,000 pounds.

(2) *Capability of tractor prime movers.* Recommended loads for a heavy crawler tractor are listed in table 7-39. Experience shows that loads heavier than these result in greatly increased equipment failure and frequent inability of the tractor to move the load under soft snow conditions.

Table 7-39. Capability of Tractor Prime Movers

	1	2	3
1	Class	Net weight (lb)	Load (tons)
2	Tractor, full-tracked, diesel-engine driven, heavy drawbar pull, low ground pressure (LGP), Caterpillar D8, with D-342 engine	72, 000	40
3	Same as above, but with D-353 engine	72, 000	50

Note. Not used when traveling over unprepared trails or cross-country.

(3) *Payload capacity.* Assuming that marked trails will be used, weather delays will be encountered, and malfunctioning equipment will be dropped for later recovery, the payload capacity of five tractor sled trains (D8 LGP with D-342 engine as prime mover), consisting of one command train (one tractor pulling four wanigans) and four cargo trains (four tractors each pulling four loaded 10-ton sleds or 10-ton trailers or two loaded 20-ton sleds), on 161- and 322-kilometer destination trips is as determined in table 7-40.

(4) *Rates of speed.* Performance figures in table 7-41 pertain to the D8 (Caterpillar) LGP tractors used in Greenland by the U.S. Army Polar Research and Development Center and in Antarctica by the U.S. Navy Antarctic Support Force. The tractors are equipped with either the D-342 or the D-353 turbocharged engine.

Table 7-40. Payload Capacity of Tractor Sled Trains

1	1 Factors	2 322-km round trip	3 644-km round trip
2	Fuel per tractor—2.22 gallons per km X km (round trip)	715 gal	1,430 gal.
3	Gal per tractor X 5 tractors	3,575 gal	7,150 gal.
4	Plus 15-percent safety margin	536 gal	1,072 gal.
5	Total gal	4,111 gal	8,222 gal.
6	Total gal X 7.75 lb per gal (bulk diesel at 10° F.)	31,860 lb	63,720 lb.
7	Lubricants, alcohol, and antifreeze—30 lb per tractor per 161-km	300 lb	600 lb.
8	Travel time at 80.5 km per day	4 days	8 days.
9	Fuel for snow melters, heaters, and electric generators in command train—180 gal per day X 7.75 lb per gal.	5,580 lb	11,160 lb.
10	Total domestic load (line 6 + line 7 + line 9)	37,740 lb, or 18.87 STON.	75,480 lb, or 37.74 STON.
11	Gross capacity: 4 cargo trains X 40 STON per train	160 STON	160 STON.
12	Payload capacity (line 11—line 10)	141.13 STON	122.26 STON.

Note. Rations, tools, repair parts, and survival equipment are carried in or on the wanigans of the command train. This permits the sleds or trailers of the cargo trains to be used fully as cargo carriers.

Table 7-41. Vehicle Speed of Tractors

1	1 Gear	2 D-342 Speed (kmph) Forward	3 D-342 Speed (kmph) Reverse	4 D-353 Speed (kmph) Forward	5 D-353 Speed (kmph) Reverse
2	1st	2.41	3.21	3.25	3.25
3	2d	3.05	4.18	4.61	4.61
4	3d	4.50	6.11	5.63	11.97
5	4th	6.11	----	8.65	----
6	5th	8.36	----	11.97	----

7-53. Human Bearers

a. General. Human bearers consist of indigenous or other personnel used for the transportation of personnel and/or supplies. Their use is generally limited to those situations where other means are impracticable or not available.

b. Planning Data. For planning purposes the following factors may be assumed:

(1) Cargo loads.

(*a*) Male bearer—80 pounds' average load.

(*b*) Female bearer—30 to 35 pounds' average load.

(2) Personnel loads—8 to 12 bearers per litter team (for continuous operation).

(3) Rate of march—19 kilometers in the day under average conditions and level terrain.

(4) Overloading and speedup of operations cause desertions and increase the sick rate.

(5) Noneffective rate—30 percent.

(6) Close supervision required to prevent pilferage.

CHAPTER 8

LOGISTICS—SERVICE

Section I. GENERAL

8–1. Coverage

This section contains information on and measurement factors involved in the services of construction and maintenance.

8–2. Cross References

a. Troop requirements for all services are found in paragraphs 4–1 through 4–7 and in FM 101–10–2.

b. Tactical signal communications are covered in paragraphs 4–19 through 4–26.

c. Field engineering is covered in paragraphs 4–27 through 4–34.

d. Characteristics of selected materiel are covered in chapter 5.

8–3. Base Development

a. General. See FM 100–10 for the general aspects of base development planning, including responsibilities, planning considerations, the planning directive, elements of base development plans, and a sample format for a base development plan.

b. Phases of Base Development.

(1) *Assault and consolidation.* This is the period for assault and consolidation by the combat forces in objective area. Some elements of the base command are attached to tactical units and arrive early in the operation to assist in initiating base development.

(2) *Exploitation.* This period covers the time between the establishment of the combat forces in the objective area and the time that tactical operations have progressed sufficiently to consider the base area relatively secure from ground attack.

(3) *Development.* This is the principal period for base development. It extends from the time the base area is relatively secure from ground attack until cessation of tactical operations or until rollup begins.

c. Logistic Requirements for Base Development. Logistic requirements for the three phases of base development vary widely. During the assault and consolidation phase logistic requirements are characteristic of those peculiar to amphibious or airborne operations (FM 31–12 and FM 61–100). During the exploitation phase requirements become progressively more stable, centralized, and predictable. In the development phase installations are completed, streamlined, and balanced to produce an efficient, flexible operating base. (For detailed estimates of materials and efforts required, see TM 5–301, TM 5–302, and TM 5–303. General estimates are given in paragraph 8–9.)

d. Logistic Data for Base Development. Data applicable to the various phases of initial base development planning are found throughout this manual. Data pertaining to major base development tasks are as follows:

(1) Storage—paragraphs 5–26 through 5–33.

(2) Hospital bed requirements—paragraphs 6–10 through 6–12.

(3) Transportation—chapter 7.

(4) Construction—paragraphs 8–4 through 8–13.

(5) Communications — paragraphs 4–19 through 4–26.

Section II. CONSTRUCTION

8–4. Engineer Construction Troops

a. Battalion Month. One battalion month is the construction effort of an average experienced and properly equipped engineer construction battalion during 1 month. For general estimates the battalion month represents 125,000 man-hours of construction effort. This effort can be subdivided into 71,000 man-hours of horizontal construction (e.g.,

earthmoving, drainage, paving, aggregate production) and 54,000 man-hours for vertical construction (e.g., carpentry, plumbing, electrical, and painting). This productivity is based on 100-percent authorized unit strength and each man working a 10-hour day 6-day week.

b. Force Estimates. The force estimates outlined herein should be used as a general planning guide only. They must be modified for known or expected conditions of particular operations.

c. Unit Equivalents. It is not practicable to state an average factor for construction effort of the various other engineer units, based on the battalion-month yardstick, as defined in *a* above, which is applicable to all types of construction projects. The quantity and type of equipment assigned to the unit and its training are important factors in determining unit effectiveness on a particular type of construction work. For example, an engineer combat battalion is more effective than an engineer construction battalion in repairing roads in a combat zone (average factor 1.3), but an engineer combat battalion is much less effective than an engineer CB in constructing a new road in the communications zone (COMMZ), which requires considerable earthmoving (average factor 0.6). The factors in table 8–1 are based on the assumption that, in general, the average construction project in a combat zone requires much less heavy engineer equipment than the average construction project in a COMMZ. The factors apply only to properly equipped engineer units of average experience. These factors should be used only in broad planning and do not apply to any one particular construction project. The many factors involved make it advisable that an experienced engineer officer, *familiar with the technical details of a particular project*, determine the type of engineer unit to be assigned to the construction project whenever practicable.

Table 8–1. Construction Effort Factors

1	1 Unit	2 Average construction effort factor: Combat Zone	3 Average construction effort factor: COMMZ
2	Engr Construction Battalion	1.0	1.0
3	Engr cbt bn	1.3	0.6
4	Engr cbt bn plus LE co	1.4	0.9
5	Engr CB plus const spt co	1.2	1.4

8–5. Roads

a. Road Nets.

(1) Construction and maintenance of roads in a theater of operations are held to the minimum required by the situation and are based on maximum use of the existing road net. The capacity of roads of various types, in short tons forward per day, is given in paragraph 7–13.

(2) Normally, the minimum two-lane road nets to be provided and maintained are as follows:

(*a*) In the combat zone—

1. One earth road per division forward of division rear boundary.

2. Two improved (e.g., gravel, crushed rock) roads per corps forward of field army rear boundary.

3. Lateral improved roads at 16-kilometer intervals in rear of division rear boundary.

4. Access roads as required at depots, supply points, and other installations in corps rear and field army service areas.

(*b*) In the COMMZ—

1. Two bituminous surface-treated roads to each field army service area. Connecting roads as required to ports and beaches.

2. Access roads as required at depots and other installations in the COMMZ.

b. Construction of New Roads.

(1) *Construction policy.* New road construction is undertaken only when absolutely necessary, and normally it includes only such items as detours to bypass demolitions and access roads. The factors in tables 8–2 through 8–5 are given primarily for estimating rehabilitation as a percentage of the requirements for new construction.

(2) *Bridge and culvert requirements.* For planning purposes, it is assumed that 1 kilometer of new road requires 7.5 meters (24.8 feet) of bridging and from 3.7 culverts in flat terrain to 13 culverts in mountainous terrain.

(3) *Material requirements.* Material requirements for 1 kilometer of new road (including bridges, culverts, and asphalt for surfacing) are given in tables 8–2 and 8–3.

(4) *Fixed-bridge superstructure requirements per kilometer of road.* Table 8–4 provides fixed bridge superstructure requirements for 1 kilometer of road, based on 7.5 meters (24.8 feet) of bridging

Table 8-2. Material Requirements for 1 Kilometer of New Road

1	Type of road	2	3	4	5
		Single-lane 3.7-m (12-ft) wide		Double lane 7.3-m (24-ft) wide	
		STON	MTON	STON	MTON
2	Earth, graded and drained	2.5	1.9	3.1	2.9
3	102-mm (4-in.) (two-lane 152-mm) (6-in.) stabilized earth or stone	3.1	2.5	6.2	4.3
4	25-mm (1-in.) cold surface treatment on 102-mm (4-in.) (two-lane 152-mm) (6-in.) crushed stone	18.6	21.1	33.5	42.2
5	25-mm (1-in.) surface treatment on existing base	13.6	18.6	27.3	37.8
6	51-mm (2-in.) cold road mix, cold laid asphalt on 152-mm (6-in.) crushed stone	27.3	38.8	52.7	77.6
7	76-mm (3-in.) cold road mix, cold laid asphalt on 152-mm (6-in.) crushed-run base	35.9	47.7	70.0	94.2

Table 8-3. Gravel or Crushed-Rock Requirements for 1 Kilometer of New Road

1	Type of road	2	3	4	5
		Surface 3.7-m (12-ft) wide		Surface 7.3-m (24-ft) wide	
		Cu m (cu yd)	STON	Cu m (cu yd)	STON
2	102-mm (4-in.) base*	371 (485)	726	742 (970)	1,452
3	51-mm (2-in.) asphalt surface	185 (243)	363	370 (485)	726
4	152-mm (6-in.) base*	557 (728)	1,082	1,114 (1,456)	2,164
5	76-mm (3-in.) asphalt surface	278 (364)	546	556 (728)	1,092

*Based on loose thickness. For compacted thickness, add 25 percent.

*Table 8-4. Fixed Bridge Superstructure Requirements for 1 Kilometer of Road**

1	Type of span	2	3	4	5	6	7	8	9
		Percentage	Meters (feet)	One-lane			Two-lane		
				STON	MTON	Manhours	STON	MTON	Manhours
2	4.2- to 6.1-m (14- to 20-ft) timber—cl 25	20	1.5 (5.0)	2.7	2.6	45	3.0	4.0	75
3	9.2-m (30-ft) span, 6- to 27-in. WF beams—cl 60	21	1.6 (5.2)	NA	NA	NA	3.0	2.5	35
4	18.2-m (60-ft) span, 6- to 36-in. WF beams—cl 60	24	1.8 (6.0)	NA	NA	NA	3.6	3.2	46
5	24.3-m (80-ft) span, 9- to 36-in. WF beams—cl 60	12	0.9 (3.0)	NA	NA	NA	2.7	2.4	30
6	27.3- to 36.5-m (90- to 120-ft) span, 6- to 48-in. steel girders—cl 60	11	0.8 (2.7)	NA	NA	NA	3.2	2.6	30
7	39.6-m (130-ft) Bailey, through truss, DD	12	0.9 (2.9)	4.9	5.5	64	9.3	10.6	122
8	Total	100	7.6 (24.8)	NA	NA	NA	24.8	25.3	338

*Does not include substructure.

per kilometer of route and on average percentages of the various types of standard military bridging spans. Timber bridge data are based on typical timber bridging with 4.6-meter (15-foot) wood stringers (TM 5-286). Semipermanent steel highway bridging is described in TM 5-285 and TM 5-302. One-lane bridging is not applicable to WF-beam bridges. Bridging is estimated at 75-percent timber and 25-percent steel stringers on wood substructures.

(5) *Construction effort.* Table 8-5 shows the net effective man-hours of engineer construction effort required for grading and surfacing 1 kilometer of new road to the following standards: one-lane road (3.7-meter traffic lanes plus 1.2-meter shoulders); double-lane road (7.3-meter traffic lane plus 1.2-meter shoulders). The table is based on pit-bank run gravel, except for lines 6 and 7, which are based on crushed rock. Man-hour efforts for bridging and culverts are not included.

Table 8-5. Construction Effort in Man-Hours for 1 Kilometer of New Road

1	Terrain	2	3	4	5	6	7
		One-lane plus 1.2-m (4-ft) shoulders			Double-lane plus 1.2-m (4-ft) shoulders		
		Grading only	Grading and 152-mm (6-in.) gravel	Grading 152-mm (6-in.) gravel and 76-mm (3-in.) asphalt	Grading only	Grading and 153-mm (6-in.) gravel	Grading 152-mm (6-in.) gravel and 76-mm (3-in.) asphalt
2	Swamp, avg 4-ft fill, no vegetation	2, 090	4, 640	7, 440	3, 100	6, 850	8, 250
3	Flat prairie, avg vegetation, 0 to 20% rock	1, 140	2, 840	4, 710	1, 690	4, 190	5, 130
4	Rolling, avg vegetation, 0 to 20% rock	3, 730	5, 800	7, 650	5, 520	8, 270	9, 300
5	Hilly, forested, 0 to 20% rock	7, 200	9, 240	11, 480	10, 670	13, 670	14, 800
6	Mountain, forested, no rock	9, 600	11, 810	14, 210	14, 230	17, 480	18, 700
7	Mountain, 1 to 20% rock	16, 000	18, 210	20, 610	23, 700	26, 750	28, 170
8	Mountain, 20% rock	21, 600	23, 810	26, 210	32, 000	32, 250	36, 470

c. Road Rehabilitation. Materials and effort required to rehabilitate roads after action, in percentages of the materials and effort required for new construction, are shown in table 8-6.

Table 8-6. Rehabilitation—Equivalent Percentages

1	1 Rehabilitation of—	2 Equivalent percentages of new construction
2	Roads	10 to 20.
3	Culverts	15.
4	Bridges	50 to 90.

d. Road Maintenance. After rehabilitation, and not allowing for further damage in action, suitably trained and equipped engineer troops maintain roads on the basis of 9½ man-hours' net effective effort per kilometer of road per day.

e. Policy for Road and Bridge Construction.

(1) *Responsibility.* Bridging is normally on an area basis between the combat zone and the COMMZ. Theater army support command (TASCOM) forces take over bridging operations in rear of the field army area as rapidly as possible. Rearward elements assume bridge and road maintenance in forward areas as soon as the situation permits. Rearward engineer units replace tactical and other portable types of bridging with nonportable types as quickly as possible, strengthen bridging to carry successively heavier loads, and remove such tactical bridging as the situation justifies.

(2) *General bridge policy.* Tactical bridging is normally placed by corps engineers. Organizational equipage is replaced as quickly as possible by rearward engineers. Stocks of WF-beam, girder, I-beam, 27.4-meter (90-foot) pony truss bridging and timber trestle bridging with steel beams are available in depots for use in the COMMZ, and in the combat zone when time and the tactical situation permit. Bailey bridging will be used primarily in the combat zone. Replaced and surplus bridging is returned to depots.

8–6. Railway Construction

a. New Construction.

(1) The railroad division used in planning includes 160 route kilometers of main line, single or double track, together with its terminal operating and maintenance facilities, fueling and watering facilities as required, and the necessary signaling equipment or interlocking facilities for safe operation. Passing sidings on single-track lines, stations, and crossovers at double-track lines at stations are at intervals as required by the traffic. Normally, at least one spur or siding is provided at each station.

(2) Materials and man-hours (net effective) required for new construction of 1 kilometer of standard-gage (1.435 meters (4 feet 8½ inches)), single-track railroad are shown in table 8–7. Grading includes clearing based on average wooded terrain. Ballast is supplied from bank-run material and the average haul is 5 kilometers.

Table 8–7. Construction Requirements for 1 Kilometer of Standard-Gage Railroad

1	Item	2 STON	2 MTON	4 Man-hours
2	Grading			3, 100
3	Ballast delivered			1, 550
4	Track laying and surfacing			2, 100
5	Bridging—13.25 m per km	79	68. 9	2, 000
6	Culverts—4 per km—average 12-m length	5	4. 3	870
7	Ties—1,798	60	120. 0	------
8	Rail—90 lb	98	43. 0	------
9	Fastening (based on 11.9-m rail)	21	6. 2	------
10	Total	263	242. 4	9, 620

b. Rehabilitation. Table 8–8 reflects the rehabilitation requirements that can be anticipated for a 100-kilometer standard-gage, single-track line extending inland from a port, using average percentages of demolition over the entire line. For further information, see FM 55–21.

Table 8–8. Rehabilitation Requirements for 100 Kilometers of Railroad

1	Item	2 Quantity per 100 km	3 Demolition percentage	4 Amount of rehabilitation	5 Materials [1] STON	6 Materials [1] MTON	7 Man-hours [1] (thousands)
2	Main line	100 km	13	13 km	2, 370	1, 560	42. 3
3	Port trackage [2]	3 km	100	3 km	894	683	13. 7
4	Passing sidings [2]	4.5 km	80	3.6 km	1, 075	821	10. 6
5	Station sidings [2]	3 km	80	2.4 km	717	548	7. 4
6	Railway terminal [2 3]	1 each	75	75 percent	4, 410	4, 230	100. 0
7	Water stations	2 each	100	2 each	84	131	5. 6
8	Fuel station	1 each	100	1 each	13	11	0. 6
9	Bridging	1,325 m	70	929 m	5, 530	4, 830	140. 0
10	Culverts	5,300 m	15	797 m	74	65	13. 0
11	Grading						21. 8
12	Ballast						27. 4
13	Total				15, 167	12, 879	382. 4

[1] Tunnels require special consideration. To repair (by timbering) a 15-m demolition at each end of a single-track tunnel (30 m total per tunnel), allow 70 STON, 87 MTON, and 3,000 man-hours.
[2] Estimate includes ties, rails, fastenings, turnouts, and track laying and surfacing. It assumes ballast is available at worksites.
[3] Includes replacement of buildings 100 percent, ties 30 percent, and rail and turnouts 85 percent.

8–7. Water Terminal Construction

a. Approximate Planning Factors for Material and Man-Hour Requirements.

(1) Table 8–9, based on data in TM 5–301, shows the material and man-hour requirements for the construction of new water terminal facilities adequate for the handling of 1,440 short tons of discharge dry cargo per day for 20-hour operation. This is a convenient unit because it is the wharf discharge rate of two ships, Victory-type, as given in paragraph 7–6*d*. The facilities include ship or lighterage wharf space (150 meters), access road from wharf to road net, and minimum covered and open storage.

Table 8-9. Port Construction Requirements

1	Item	2	3	4	5	6	7	8	9	10
		5-foot tide			15-foot tide			25-foot tide		
		STON	MTON	Man-hours	STON	MTON	Man-hours	STON	MTON	Man-hours
	Port									
2	Steel-frame building, 2,434-sq m (building shell)	128	245	5, 523	128	245	5, 523	128	245	5, 523
3	Wood-frame building, 2,716-sq m (building shell)	250	304	8, 413	250	304	8, 413	250	304	8, 413
4	Railroad, 2.74-km	615	519	11, 170	615	519	11, 170	615	519	11, 170
5	Road, 1.77-km, two-lane (macadam and asphalt)	59	75	13, 480	59	75	13, 480	59	75	13, 480
6	Other construction on land	276	358	17, 725	276	358	17, 725	276	358	17, 725
7	Railroad approach trestle, 27.5-m by 130-m	2, 034	2, 951	27, 020	2, 222	2, 953	27, 250	2, 498	3, 633	33, 850
8	Pier, timber, 27.5-m by 150-m	2, 420	3, 629	29, 040	2, 652	4, 037	29, 200	2, 956	4, 485	35, 430
9	Ramp, landing, 800-sq m			2, 220			6, 660			11, 100
10	Wharf, lighterage, 11-m by 150-m	623	878	11, 770	623	878	11, 770	623	878	11, 770
11	Total port, using steel frame	6, 155	8, 655	117, 950	6, 577	9, 065	122, 780	7, 155	10, 193	140, 050
12	Total port, using wood frame	6, 277	8, 714	120, 840	6, 699	9, 124	125, 670	7, 277	10, 252	142, 940
	Wharves									
13	Wharf, timber, 18-m by 150-m	1, 678	2, 485	21, 340	1, 831	2, 753	21, 780	2, 040	3, 062	24, 610
14	Wharf, railroad approach trestle, 30-m	282	405	5, 900	310	451	6, 040	343	401	6, 820
15	Wharf, road approach, 30-m	84	121	3, 230	91	133	3, 240	100	146	3, 460

(2) Table 8–10 shows the material and man-hour requirements for the rehabilitation of a 150-meter deep-draft wharf, clearance of debris, and new construction of other terminal facilities for 720 short tons per day. This includes repair of cratered wharf faces by timber and V-trestle construction to a width of 18 meters.

Table 8–10. Rehabilitation, 150-Meter Deep-Draft Wharf

1	Item	2 STON	3 MTON	4 Man-hours
2	Repair of 150-m deep-water wharf	1, 375	2, 910	25, 000
3	1.12-km access road, asphalt-surfaced, 7.3-m wide	70	87	14, 000
4	3.2-km railroad, including sidings	822	710	14, 500
5	929-sq m (10,000-sq ft) covered storage	65	80	1, 800
6	5,574-sq m (60,000-sq ft) open storage			50
7	Clearing debris			2, 500
8	Total	2, 332	3, 787	57, 850

(3) Table 8–11 shows the material and man-hour requirements for the rehabilitation of a 107-meter lighterage wharf, clearance of debris, and new construction of other port facilities for 720 short tons per day. This includes repair of cratered wharf faces by timber or steel-sheet pile.

Table 8–11. Rehabilitation, 107-Meter Lighterage Wharf

1	Item	2 STON	3 MTON	4 Man-hours
2	Repair of 107-m lighterage wharf	580	920	10, 500
3	1.12-km access road, asphalt-surfaced, 7.3-m wide	70	87	14, 000
4	3.2-km railroad, including sidings	822	710	14, 500
5	929-sq m (10,000-sq ft) covered storage	65	80	1, 800
6	5,574-sq m (60,000-sq ft) open storage			50
7	Clearing debris			1, 100
8	Total	1, 537	1, 797	41, 950

b. Construction Rate for Pile-and-Timber Wharves. Normally, one engineer construction company constructs 150 meters of deep-draft marginal wharf, or equivalent, in 6 days. These rates cannot be improved by using a force larger than a company on one wharf structure of this size because of the sequences necessary in pile driving, capping, bracing, and deck construction.

c. Demolition of Existing Facilities. Table 8–12, based on experience factors in the invasion of developed harbors, indicates the average percentages of demolition to be anticipated. In addition, the removal of sunken wrecks or blockships may be required; normally, two or three in a small harbor, 10 or 20 in a large one. If the harbor entrance is narrow, it is usually found blocked.

Table 8–12. Average Demolition of Port Facilities

1	Facilities	2 Average demolition
2	Permanent wharves or quays.	30 percent very badly damaged; early repair impracticable. 30 percent heavily damaged; much debris; reasonably early repair possible. 40 percent lightly damaged; less debris; early repair practicable.
3	Port cranes	100 percent destroyed.
4	Port warehouses	50 percent to 100 percent destroyed.

d. Utilities Required at Ship Wharves.

(1) *Fresh water.* With pressures normal in municipal water supply, one 4-inch pipeline with three 2½-inch outlets refills a Liberty ship's capacity of 115,000 gallons in 6 hours.

(2) *Illumination.* Five-hundred-watt incandescent lamps, mounted 10.5 meters above the wharf deck and spaced at intervals of 35 meters, provide adequate illumination averaging 1 to 2 foot-candles.

e. Construction Factors for Specific Types of Marginal Lighterage Wharves Per 30 Meters. These factors are illustrated in table 8–13.

f. Construction Factors for Floating Pontoon Wharves. (Reference—FM 5–35/AFM 88–54.) A

floating wharf suitable for a Victory or Liberty ship berth is 6 pontoons wide by 72 pontoons long or 13 by 123 meters. Four approaches, each 4 by 18 pontoons, 8.5 by 33 meters, are usually adequate. Total area of wharf and approaches is 2,854 square meters. The construction factors are as indicated in table 8–14.

Table 8–13. Construction Factors, Lighterage Wharf

1	1 Type of construction	2 STON	3 MTON	4 Man-hours
2	Timber pile, 10.7-m wide, using 12-m piles.	171	228. 0	2, 400
3	Timber crib, supporting timber bents, 10.7-m wide.	143	193. 0	2, 800
4	Timber retaining wall (Wakefield pile) with earth or rubble fill.	21	30. 5	1, 300
5	Steel-sheet-piling retaining wall with earth or rubble fill.	27	25. 0	1, 100

Table 8–14. Construction Factors, Pontoon Wharves

1	1 Floating pontoon wharves	2 STON	3 MTON	4 Man-hours
2	Per 93 sq m	42	127	343
3	Wharf and approaches as above 2,854 sq m	1, 290	3, 900	10, 535

g. Construction Reqirements for Over-the-Beach Discharge of Cargo. Construction requirements for over-the-beach discharge of cargo include the construction of ramps, hardstands, egress roads, and beach stabilization. In general, local materials are used. The length of the ramps varies, depending on beach gradient and tidal range. The length of the ramp can be computed by the following formula:

> Beach gradient (in meters per hundred meters) × (tide range (in meters) + 1.2) = ramp length (in meters).

The man-hours required for the construction of 30 meters of various types of ramps, hardstands, and beach stabilization are as shown in table 8–15.

Table 8–15. Construction Requirements for Over-the-Beach Discharge of Cargo

1	1 Facility	2 Man-hours
2	Amphibious vehicle ramp, 17-m wide by 30-m long by 0.45-m deep	930
3	Landing craft ramp (LCU/LCM/LST), 8.8-m wide by 30-m long by 0.45-m deep	480
4	Hardstands and beach stabilization, 30-m wide by 30.4-m long by 0.15-m deep.	555
5	Maintenance: Ramps: 10 percent of initial effort per month. Hardstands and beach stabilization: 10 percent of initial effort per quarter.	

Note. See paragraph 8–5 for road construction factors.

8–8. Dredging

Since it is a slow operation, dredging of harbors in a military operation should be avoided if possible. Likewise, because of the danger of damaging foundations, plans should not call for dredging near quay walls. Generally, demolition debris can be cleared in front of berthing sites by using dragline or clamshell cranes. If dredging of harbors areas is unavoidable, the overall planning factors in table 8–16 may be used as a guide. Dredging quantities vary considerably with the type of equipment used, the distance of haul to the spoil area, the method of haul, and the kind of material being excavated (sand, mud, gravel, soft rock or coral, hard rock). Large-capacity shovels with clamshells or draglines may be mounted on barges and floated to the site.

8–9. General Construction

a. General. This paragraph presents planning factors for engineer materials and man-hours required for construction of facilities in the following categories:

(1) Troop camps.
(2) Administration.
(3) Hospitals.
(4) Depots.
(5) Shops.
(6) Iceplants and refrigerated storage.
(7) Personnel service buildings, including laundries, drycleaning plants, bakeries, recreation centers, and base post offices.

Table 8–16. Dredging Planning Factors

1	2	3	4	5
1	Type of dredge			
	Hydraulic suction [1]	Dipper	Clamshell or orange peel	Seagoing hopper [2]
2 Size	12- to 18- in. pipe	1.5- to 12.0-cu m	1- to 7-cu m	385- to 6,230-cu m.
3 Operating personnel	Varies from 12- to 90-man crews, depending on size of dredge and number of shifts being worked.			
4 Operating characteristics and principal use.	Best in soft or loose material, but can also dig firmer material varying from compacted sands and conglomerates to some types of coral.	Clay, loose rock, or debris excavation. Generally requires loading in scows for disposal.	Dredging in limited areas, caisson work, debris clearance. Generally requires loading in scows for disposal. The material dredged is of the softer type, such as silt and mud.	Outer harbor work. Spoil area may be several miles away.
5 Maximum swells affecting operations.	0.9 m (3 ft)	1.5 m (5 ft)	1.5 (5 ft)	Designed for dredging in rough water.
6 Maximum dredging depth	7.6–19.8 m (25–55 ft)	6.0–15.2 m (20–50 ft)	Great depths	11.0–18.2 m (36–60 ft).
7 Average daily capacity [3]	2,180 cu m (12-in. pipe)	1,500 cu m (1.5-cu m dipper)	380 cu m (1-cu m clamshell or orange peel).	4,000 cu m (385-cu m hopper).
	20,000 cu m (28-in. pipe)	6,900 cu m (12.0-cu m dipper).	3,200 cu m (7-cu m clamshell or orange peel).	7,650 cu m (6,230-cu m hopper).

[1] Disposal is by pipeline to upland disposal areas or in water areas a sufficient distance from the dredged areas to prevent significant infill.

[2] Hopper dredges are used primarily in dredging inlet channels leading from exposed offshore areas to a sheltered harbor. In a military operation it is probable that all other dredging will be accomplished with local dredges of other types.

[3] Based on 24-hour operation at 60-percent effective time.

(8) Prisoner-of-war (PW) camps.

b. Troop Camps.

(1) *Standards.* Troop camp requirements are estimated in six standards intended for varying degrees of permanence.

(*a*) *Standard 1.* Table of organization and equipment (TOE) tents; no engineer materials or effort involved.

(*b*) *Standard 2.* Class IV tents pitched by using troops; engineer effort for roads and site preparation.

(*c*) *Standard 3.* Buildings with floors for administration, bathhouses, infirmaries, storehouses, and kitchens. Class IV tents with floors for housing and with earthen floors for all other purposes. Roads within the installations stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, and kitchens. Electric distribution to buildings. Pit-type latrines.

(*d*) *Standard 4.* Buildings with floors for all purposes except housing, for which there are class IV tents with floors and wood frames. Roads within the installations stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, kitchens, and camp exchange. Electric distribution to all facilities. Pit-type latrines.

(*e*) *Standard 5.* Buildings with floors for all purposes; otherwise the same as standard 4 above.

(*f*) *Standard 6.* Water piped from central storage tank to latrines; latrines equipped so that waterborne, untreated sewage carried 300 meters beyond the confines of the camp; bituminous surfacing of roads within the installations; otherwise, the same as standard 5 above.

(2) *Structures.* Structures are prefabricated (metal-type) or wood frame for all climates. Table 8–17 indicates material and man-hour requirements, based on use of prefabricated and wood-frame buildings for the various standards of camps in the temperate climate, for from 250 to 3,000 men. Fine and coarse aggregate requirements are not included in material figures, since these requirements are assumed to be available in usable form within a short-hauling distance (less than 8 kilometers).

c. Administration Facilities.

(1) *Standards.* Estimates are based on three standards: standard 3, standard 4, and standard 6. Standards specifications are the same as for troop camps.

(2) *Structures.* Structures are primarily prefabricated. Material and man-hour requirements for administrative offices of 930, 2,320, and 4,650 square meters in temperate climate are listed in table 8–18.

d. Hospitals.

(1) *Standards.* Estimates are based on four standards as follows:

(*a*) *Standard 2.* Facilities in class IV tents with some buildings (clinic, latrines, building for servicing ward patients); hospital tents framed; personnel tents pitched by using troops with no engineer material or assistance. Water piped from central storage tank to necessary facilities. Concrete floors for tentage with frames and for buildings. Waterborne sewage in buildings and pit latrines for other facilities. Roads unimproved. Electric distribution to all facilities.

(*b*) *Standard 3.* Same as standard 2, except that all sewage waterborne, roads stabilized, and additional buildings provided.

(*c*) *Standard 4.* Same as standard 3, except that all tents framed and floored and additional buildings provided.

(*d*) *Standard 6.* Same as standard 4, except that buildings provided for all facilities and roads bituminous surfaced.

(2) *Material and man-hour requirements.* Requirements for 100 to 1,000-bed hospitals of the above standards are as shown in table 8–19.

e. Depots.

(1) *Standards.* Estimates are based on four standards of construction for covered and open dry cargo storage and three standards for ammunition storage as follows:

(*a*) *Dry cargo storage.*

1. Standard 2. Class IV tents for all facilities requiring cover. Open storage cleared, graded, and drained. Roads graded, but not surfaced.

2. Standard 3. Sheds for covered storage; class IV tents with floors for administrative space; without floors for other facilities requiring cover. Roads stabilized. Railroad sidings to open storage areas. Drainage and fencing provided when required.

3. Standard 4. Storage on 152 millimeters (6 inches) of crushed stone with asphalt binder. Administration in tents and latrines in buildings.

Table 8–17. Troop Camp Construction Requirements

1	1 Standard	2 Size (number of men)	3 Electric (kw)	4 Water (M gal per day)	5 Site area (sq m)	6 With steel-frame buildings STON	7 MTON	8 Man-hours	9 With wood-frame buildings STON	10 MTON	11 Man-hours
2	1	Organic tents—no engineer materials or effort required.									
3	2	Class IV quartermaster tents erected by using service. Engineer effort required for roads and site preparation.									
4	3	250	2.2	3.75	31,155	89	128	7,570	103	130	8,090
5		500	7.9	7.50	80,000	166	239	13,740	192	241	14,840
6		1,000	12.6	15.00	164,610	322	451	28,690	366	463	30,900
7		1,500	15.4	22.50	208,000	456	634	39,555	518	650	42,715
8		3,000	27.0	45.00	424,000	825	1,149	72,120	939	1,177	77,900
9	4	250	5.4	3.75	31,155	142	199	11,070	159	201	11,860
10		500	17.3	7.50	80,000	297	431	23,120	440	572	25,240
11		1,000	31.6	15.00	164,610	563	800	44,250	633	840	48,200
12		1,500	39.4	22.50	208,000	782	1,076	61,240	877	1,101	65,590
13		3,000	78.0	45.00	424,000	1,488	2,092	118,180	1,672	2,106	128,830
14	5	250	5.5	3.75	31,155	195	296	13,590	228	392	15,910
15		500	17.3	7.50	80,000	401	607	27,890	477	613	32,670
16		1,000	31.3	15.00	164,610	764	1,155	53,260	897	1,145	62,590
17		1,500	39.1	22.50	208,000	1,072	1,626	73,030	1,242	1,597	86,490
18		3,000	77.5	45.00	424,000	2,103	3,181	141,970	2,441	3,108	169,210
19	6	250	5.5	6.25	31,155	204	308	14,650	233	301	16,290
20		500	17.4	12.50	64,550	423	637	28,270	491	632	33,080
21		1,000	31.4	25.00	164,610	808	1,221	53,140	929	1,182	62,330
22		1,500	39.0	37.50	208,000	1,143	1,718	73,900	1,311	1,662	87,810
23		3,000	78.4	75.00	424,000	2,268	3,407	145,640	2,607	3,303	172,440

Table 8-18. Administration Facilities Construction Requirements

1	1 Standard	2 Size of office space (M sq m)	3 Electric (kw)	4 Water (gal per day)	With steel-frame buildings 5 STON	6 MTON	7 Man-hours	With wood-frame buildings 8 STON	9 MTON	10 Man-hours
2	3	0.93	12.6	250	97	152	6,400	110	142	7,510
3		2.32	28.5	625	229	362	15,275	261	340	18,135
4		4.65	56.5	1,250	443	704	27,850	504	654	33,550
5		0.93	12.6	250	115	158	7,120	139	178	8,500
6		2.32	28.5	625	247	387	16,010	289	366	19,150
7		4.65	56.5	1,250	471	740	28,760	543	706	34,700
8	6	0.93	12.6	1,250	126	178	7,960	150	198	9,340
9		2.32	28.5	3,120	272	423	17,290	312	402	20,420
10		4.65	56.5	6,250	509	800	30,810	676	836	36,750

Table 8-19. Hospital Construction Requirements

1	1 Standard	2 Size (beds)	3 Electric (kw)	4 Water (M gal per day)	5 Site area (sq m)	With steel-frame buildings 6 STON	7 MTON	8 Man-hours	With wood-frame buildings 9 STON	10 MTON	11 Man-hours
2	2	100	81.2	5.0	40,470	331	521	29,050	351	502	30,860
3		200	104.1	10.0	54,500	441	687	38,530	462	665	39,254
4		300	146.0	15.0	74,500	649	1,004	60,950	690	967	60,480
5		500	193.9	25.0	100,000	833	1,300	77,670	884	1,255	79,070
6		750	248.0	37.5	128,500	1,072	1,627	98,720	1,136	1,579	100,670
7		1,000	276.0	50.0	157,500	1,254	1,904	111,820	1,331	1,840	115,990
8	3	100	111.0	5.0	40,470	544	874	52,050	585	829	51,780
9		200	184.3	10.0	54,500	788	1,237	71,825	863	1,134	72,185
10		300	246.0	15.0	74,500	1,074	1,748	99,740	1,194	1,664	103,370
11		500	309.0	25.0	100,000	1,317	2,271	123,690	1,528	2,150	133,150
12		750	407.0	37.5	128,500	1,523	2,648	165,360	1,994	2,808	170,430
13		1,000	503.0	50.0	157,500	2,192	3,512	182,840	2,383	3,361	189,120
14	4	100	135.0	5.0	40,470	703	1,149	64,740	771	1,090	66,760
15		200	194.7	10.0	54,500	888	1,553	83,530	1,054	1,478	86,990
16		300	285.8	15.0	74,500	1,341	2,150	115,620	1,476	2,048	120,520
17		500	411.1	25.0	100,000	1,947	3,175	161,700	2,052	2,855	165,000
18		750	540.5	37.5	128,500	2,458	3,940	205,840	2,691	3,715	214,130
19		1,000	660.0	50.0	157,500	2,929	4,755	245,260	3,191	4,445	254,270
20	6	100	144.0	5.0	40,470	929	1,607	75,839	1,040	1,586	78,717
21		200	208.0	10.0	54,500	1,768	2,626	106,975	1,883	2,537	137,680
22		300	302.0	15.0	74,500	1,765	2,874	136,515	1,947	1,974	143,495
23		500	435.0	25.0	100,000	2,477	4,054	186,220	2,731	3,877	196,470
24		750	575.0	37.5	128,500	3,102	5,171	249,990	3,149	4,620	247,980
25		1,000	698.0	50.0	157,500	5,445	8,281	488,760	5,801	7,980	499,570

4. Standard 5. Closed buildings for covered storage and administrative facilities. Bituminous-surfaced main access roads to covered and open storage areas; other interior roads stabilized. Railroad sidings to storage areas. Drainage and fencing provided when required. Electricity provided to all buildings.

(*b*) *Ammunition storage.*

1. Standard 2. Class IV tents for 10 percent of the ammunition tonnage and for administrative facilities. Open storage areas cleared and graded. Latrines in wood-frame buildings. Access roads graded but not surfaced.

2. Standard 3. Sheds for 10 percent of the

ammunition tonnage. Buildings for administrative facilities. Access roads and parts of open storage areas stabilized with local materials. Railroad sidings to storage areas.

3. Standard 5. Ten-percent storage, administrative, checkpoint, and shop; latrine in buildings.

(2) *Material and man-hour requirements.* Requirements for storage construction of the standards in (1) above are as shown in tables 8–20, 8–21, and 8–22.

f. Shops.

(1) Paragraph 8–17*c* below indicates covered shop requirements.

Table 8–20. Storage, Dry Cargo, Covered—Depot Construction Requirements

1	1 Standard	2 Gross space (M sq m)	3 Electric (kw)	4 Site area (sq m)	5 With steel-frame buildings STON	6 MTON	7 Man-hours	8 With wood-frame buildings STON	9 MTON	10 Man-hours
2	3	1.11	----------	4,000	54	107	4,120	97	97	5,220
3		2.32	----------	6,000	106	220	6,055	147	175	7,315
4		4.65	----------	12,000	143	291	9,400	293	370	14,530
5		9.30	----------	21,200	422	878	9,495	539	700	27,490
6	5	1.11	3.1	4,000	108	163	7,200	172	199	8,610
7		2.32	6.7	6,000	204	322	10,920	275	338	12,650
8		4.65	13.3	12,000	338	495	20,010	547	672	26,010
9		9.30	27.2	21,200	800	1,273	23,340	1,021	1,180	37,690

Table 8–21. Storage, Dry Cargo, Open—Depot Construction Requirements

1	1 Standard	2 Site Size (M sq m)	3 STON	4 MTON	5 Man-hours
2	2	4.65	12	10	3,048
3		9.30	18	16	5,828
4		18.60	34	32	11,018
5	4	4.65	64	86	5,400
6		9.30	122	167	9,420
7		18.60	242	331	17,810

(2) Material and man-hour requirements for various standard 5 shops are as indicated in table 8–23.

g. Iceplants and Refrigerated Storage. Material and man-hour requirements for iceplants and refrigerated storage are as indicated in table 8–24.

h. Personnel Service Facilities. Material and man-hour requirements for personnel service buildings are as indicated in table 8–25.

i. PW Camps.

(1) *Standards.* Estimates are based on four standards of permanence (2, 3, 4, and 5) as follows:

(*a*) *Standard 2.* Class IV tents with earthen floors for all facilities. Bucket-type latrines. Engineer effort required for construction of security fencing, guard towers, and stabilized roads. Open-ditch drainage.

(*b*) *Standard 3.* Buildings for bathhouse, kitchen, latrines, and generators. All other facilities in tents. Concrete floors in buildings and tents. Electricity to all buildings and tents except PW housing. Floodlights. Other construction as in standard 2.

Table 8–22. Storage, Ammunition (10-Percent Covered; 90-Percent Open)—Depot Construction Requirements

1	1 Standard	2 Capacity (tons)	3 Site area (sq m)	4 With steel-frame buildings STON	5 MTON	6 Man-hours	7 With wood-frame buildings STON	8 MTON	9 Man-hours
2	2*	5,000	184,000	59	48	66,677	4	5	320
3	3	15,000	700,000	400	521	221,800	512	559	228,100
4	5	15,000	700,000	1,392	1,772	281,939	1,709	2,044	288,931

* Tentage materials used.

Table 8–23. Shop Construction Requirements *

1	1 Size (m)	2 Capacity (M sq m)	3 With steel-frame buildings STON	4 MTON	5 Man-Hours	6 With wood-frame buildings STON	7 MTON	8 Man-Hours
2	12.2 by 30.5	0.37	20	34	818	70	96	3,920
3	18.3 by 91.5	1.67	83	152	2,820	236	328	12,600
4	24.0 by 73.2	1.78	91	160	3,041	262	340	14,900
5	36.6 by 73.2	2.68	----------			302	423	16,490
6	42.7 by 97.6	4.16	----------			512	717	30,730

*Figures are for phase I construction.

Table 8–24. Storage, Refrigerated—Depot Construction Requirements

1	1 Facility	2 Size	3 Electric (kw)	4 Water (gal per day)	5 STON	6 MTON	7 Man-hours
2	Warehouse	118-sq m	73.0	0	107	267	4,171
3	Warehouse	223-sq m	103.0	0	171	428	5,763
4	Warehouse	1,635-sq m	539.0	900	1,009	2,596	33,470
5	Iceplant	1.0-ton	9.0	250	15	38	870
6	Iceplant	3.6-ton	15.0	1,000	22	108	1,120
7	Iceplant	15.0-ton	47.0	4,000	114	272	2,950

(*c*) *Standard 4.* Personnel housed in framed tents. Bucket-type latrines. Other accommodations in buildings. Concrete floors for tents and buildings. Other construction as in standard 3.

(*d*) *Standard 5.* All accommodations in buildings. Other construction as in standard 4.

(2) *Material and man-hour requirements.* Data in table 8–26 are extracted from TM 5–301.

j. Bivouacs, Camps, and Billets.

(1) *Bivouac areas.* The bivouac area of an infantry battalion varies from 0.093 square kilometer to 2.6 square kilometers as indicated by the situation. Considerations that affect the area required are the dispersion necessary to reduce the threat of enemy attack, the amount of cover and concealment available, and the characteristics of the terrain. The approximate minimum area required by a unit may be estimated as indicated below.

Note. Both methods should be used and the larger figure chosen.

(*a*) *Vehicle dispersion.* When required dispersion of the vehicles with the unit governs, use the following formula:

$$\frac{V \times D^2}{K} = \text{area required, when}$$

V = number of vehicles with the unit.
D = desired dispersion between vehicles.
K = conversion factor, as appropriate, to reduce the area to acres, hectares, square miles, or square kilometers.

Example: Assume that an infantry battalion has 200 vehicles and dispersion of 100 meters between vehicles is desired. Find the area required.

$$\frac{200 \times (100)^2}{1{,}000{,}000 \text{ (sq m per sq km)}} = 2 \text{ sq km}$$

Personnel will be distributed throughout the area.

(*b*) *Tent camps—capacity.* Medium general-purpose tent, normal assignment—from 12 to 16 men per tent; area required for an infantry battalion camp (open ground)—approximately 0.13 square kilometer; estimate of area required—50 square meters per man; 100 square meters per vehicle.

(2) *Data on tentage.* Table 8–27 is extracted from FM 20–15 and FM 20–16.

Table 8–25. Personnel Service Facilities Construction Requirements

1	1 Facility	2 Size	3 Electric (kw)	4 Water (M gal per day)	5 With steel-frame buildings STON	6 MTON	7 Man-hours	8 With wood-frame buildings STON	9 MTON	10 Man-hours
2	Drycleaning plant, with boilerhouse	1,000-man	34. 5	0. 21				81	106	3, 620
3	Drycleaning plant, with boilerhouse	2,500-man	46. 3	0. 26				93	120	4, 060
4	Drycleaning plant, with boilerhouse	5,000-man	74. 5	0. 40				118	148	4, 750
5	Laundry, with boilerhouse	2,500-man	35. 4	45. 00				174	230	6, 650
6	Laundry, with boilerhouse	5,000-man	69. 0	94. 00				251	315	8, 620
7	Laundry, with boilerhouse	10,000-man	117. 4	166. 00				441	534	15, 250
8	Base post office, type O, std 3	1,040-sq m	8. 2	0. 09	86	144	6, 270	136	167	7, 195
9	Base post office, type P, std 3	1,490-sq m	21. 8	0. 13	137	224	8, 790	168	210	8, 680
10	Base post office, type U, std 3	7,400-sq m	49. 4	0. 52	695	1, 161	39, 320	816	1, 041	38, 150
11	Recreation center, std 2[a] and 3[a]	5,000-man	21. 4	10. 00				[b] 131	[b] 171	[b] 9, 670
12	Recreation center, std 4	5,000-man	28. 3	10. 00	350	538	21, 790	495	676	28, 120
13	Recreation center, std 5	5,000-man	40. 3	10. 00	492	758	29, 400	602	827	38, 750
14	Recreation center, std 4	10,000-man	52. 5	20. 00	622	1, 005	36, 380	867	1, 228	48, 970
15	Recreation center, std 5	10,000-man	79. 5	20. 00	888	1, 323	57, 209	1, 092	1, 441	59, 115

[a] Tentage material used.

[b] Figures apply to standard 3 only.

Table 8–26. PW Camp Construction Requirements

1	1 Standard	2 Size (number of PW)	3 Electric (kw)	4 Water (M gal per day)	5 Site area (sq m)	6 With steel-frame buildings STON	7 MTON	8 Man-hours	9 With wood-frame buildings STON	10 MTON	11 Man-hours
2	2*	250	----------	1. 25	40, 000	----------			95	113	6, 060
3	----------	500	----------	2. 50	72, 000	----------			142	177	10, 420
4	----------	1, 000	----------	5. 00	92, 000	----------			196	265	13, 710
5	----------	2, 000	----------	10. 00	160, 000	----------			290	374	22, 740
6	----------	4, 000	----------	20 00	376, 000	----------			565	786	60, 860
7	Oriental	4, 000	----------	20. 00	332, 000	----------			482	687	51, 900
8	3	500	39. 9	5. 00	72, 000	269	383	19, 720	283	389	20, 360
9	----------	1, 000	65. 9	10. 00	92, 000	441	639	29, 770	461	613	31, 240
10	----------	2, 000	126. 8	20. 00	160, 000	728	1, 068	54, 030	766	1, 082	56, 230
11	----------	4, 000	394. 0	40. 00	376, 000	11, 613	2, 422	130, 810	1, 704	2, 446	135, 250
12	Oriental	4, 000	283. 0	40. 00	332, 000	1, 160	1, 916	102, 360	1, 313	2, 088	105, 640
13	4	500	44. 0	5. 00	72, 000	372	533	25, 970	391	531	27, 160
14	----------	1, 000	73. 1	10. 00	92, 000	620	890	39, 960	648	881	41, 920
15	----------	2, 000	138. 3	20. 00	160, 000	1, 047	1, 878	75, 800	1, 159	1, 565	81, 120
16	5	500	47. 6	5. 00	72, 000	478	729	30, 590	532	714	34, 950
17	----------	1, 000	73. 3	10. 00	92, 000	808	1, 249	48, 970	895	1, 215	56, 370
18	----------	2, 000	145. 5	20. 00	160, 000	1, 471	2, 279	93, 190	1, 638	2, 203	108, 470
19	----------	4, 000	430. 4	40. 00	376, 000	2, 951	4, 631	199, 150	3, 283	4, 486	227, 110
20	Oriental	4, 000	303. 2	40. 00	332, 000	1, 794	2, 875	136, 960	1, 953	2, 848	148, 250

*Tentage material used.

Table 8–27. Tentage Data

1	1	2	3	4	5	6	7	8
	Line item number	Type of tent	Length (ft)	Width (ft)	Peak height (ft)	Floor area (sq ft)	Weight packed (lb)	Volume packed (cu ft)
2	V47071	Arctic, 10-man, FMWWR*, hexagonal	15. 2	17. 5	8. 5	198. 9	76. 0	7. 3
3	V47345	Assembly, M–1942, FMWWR*	80. 0	40. 0	18. 0	2, 856. 5	1, 755. 0	100. 0
4	V47482	Command post, M–1945, FMWWR*	20. 6	10. 0	9. 0	172. 0	257. 0	9. 9
5	V47756	Aviation maintenance, small, frame	10. 0	12. 0	12. 0	120. 0	361. 0	26. 8
6	V47893	Frame-type, balloon inflation, M–1957	15. 2	14. 0	12. 8	210. 0	930. 0	56. 5
7	V48161	Maintenance, frame, FMWWR*	32. 0	20. 0	14. 0	640. 0	2, 057. 0	237. 0
8	V48304	Maintenance, frame, insulated, sectional	16. 0	16. 0	8. 0	256. 0	2, 410. 0	259. 5
9	V48578	General-purpose, large, FMWWR*	52. 0	18. 0	12. 0	936. 0	820. 0	69. 0
10	V48989	General-purpose, medium, FMWWR*	32. 7	16. 0	10. 0	512. 0	634. 0	33. 0
11	V49126	General-purpose, small, FMWWR*, hexagonal	15. 2	17. 5	10. 5	198. 9	186. 0	8. 0
12	V49537	Hexagonal, lightweight, M–1950, FMWWR*	11. 4	13. 3	8. 5	113. 2	56. 0	3. 8
13	V49948	Kitchen, flyproof, M–1948	18. 0	12. 0	9. 0	216. 0	420. 0	26. 2
14	V50058	Maintenance shelter, FMWWR*	26. 8	18. 2	14. 0	486. 8	1, 255. 0	84. 0
15	V50496	Mountain, two-man	6. 8	14. 5	3. 6	30. 8	9. 5	0. 7
16	V50633	Nike-Hercules, air-supported	71. 4	15. 4	12. 9	995. 0	1, 425. 0	198. 0
17	V50907	Radome, air-supported, circular	24. 0	24. 0	19. 7	452. 0	1, 029. 0	85. 0
18	V52414	Maintenance, missile test shop	6. 0	8. 8	8. 6	40. 0	50. 0	3. 0
19	V52551	Missile equipment console, pulse acquisition radar, front	6. 7	8. 0	7. 7	50. 0	40. 0	4. 0
20	V52688	Missile equipment console, pulse radar, rear	4. 0	8. 0	8. 6	26. 0	40. 0	3. 5
21	V52825	Missile equipment console, range radar	6. 8	8. 3	8. 3	55. 7	60. 0	4. 0

*Fire-, mildew-, water-, and weather-resistant.

(3) *Space allowances for quarters under theater of operation conditions.*

(*a*) Normal—40 square feet of floor space and 40 cubic feet of airspace per person.

(*b*) Emergency—50 percent of the above.

(4) *Billets.* In hostile or liberated territory the capacity of a locality for billeting is approximately as follows:

Rich farming country	5 inhabitants per dwelling.
Cities	2 inhabitants per dwelling.
Average American city	20 inhabitants per vacant dwelling.
Vacant buildings and dwellings in average city (civilians may be caused to move to vacancies to concentrate military activities)	10 percent of population.
With civilians furnishing subsistence	10 percent of population for 1 week.

k. Housing Requirements Besides Troop Camps. Besides those troop housing facilities provided for normal functions of troops, it is usually necessary to provide certain installations, based on the percentages of the theater population shown in table 8–28.

Table 8–28. Housing Requirements Besides Troop Camps

	1	2
1	Facility	Percentage of theater troops
2	Recreation center	5 of total.
3	Reception center	5 of total.
4	Replacement depot	3 of total.
5	Casual camp	1 of total.
6	Ground troop training center.	5 of all ground forces.
7	Service force training center.	5 of all service troops.
8	Labor camp	5 of prewar population in area.
9	Temporary refuge for displaced persons.	5 of prewar population in area.
10	Military prisoners	1 of total.
11	Undesirable civilians (saboteurs, etc.).	5 of prewar population in area.

l. Office Space. Space allowances for offices under theater of operation conditions are: 60 square feet per person employed plus 10 square feet per drafting board.

m. Prefabricated and Standard-Frame Buildings.

(1) The following are the basic units for portable prefabricated, V-lock steel buildings:

(*a*) Barrack with basic dimensions of 20 feet by 20 feet, 30 feet by 40 feet, 40 feet by 50 feet 8 inches high and expandable in 10-foot-length increments.

(*b*) Warehouse with basic dimensions of 40 feet by 100 feet by 20 feet high and expandable in 20-foot-length increments.

(*c*) Shop with basic dimensions of 40 feet by 100 feet by 12 feet high and expandable in 10-foot-length increments.

(*d*) Units of (*a*), (*b*), and (*c*) above are interconnectable without use of especially fabricated parts.

(2) Standard-frame buildings are constructed in various dimensions and designs from standard materials listed in TM 5–302. Because of the large lumber and man-hour requirements involved, this construction is normally restricted to special-purpose buildings, such as refrigerated warehouses, iceplants, laundries, drycleaning plants, special shops, and facilities for frigid climates.

8–10. Bulk Petroleum Storage and Distribution

a. General. Tables 5–10 through 5–17 contain data pertaining to petroleum; table 5–18 contains types and capacities of pipelines. See TM 5–343 for descriptions, sizes, and operating characteristics of pipeline equipment; AR 701–5 for supply service responsibilities; and TM 10–1100 series for petroleum pipeline and terminal operating procedures and techniques. A complete pipeline system includes tanker discharge facilities and receiving tank farm at a port or beach (marine terminal); one or more parallel pipelines; tank farms, which are generally spaced from 80 to 120 kilometers apart along the system and vary from 50,000- to 1,000,000-barrel capacity, depending on supply needs and specified theater levels of supply; and dispensing facilities, which are provided at tank farms and supply points. Engineer troop units construct petroleum distribution systems.

b. Pipelines. Four-, six-, and eight-inch diameter, lightweight pipe is standard for military pipeline systems. On level terrain pump stations

are spaced 12.9 kilometers apart for 4-inch lines and 27 kilometers apart for 6- and 8-inch lines. Submarine ship-to-shore lines are 8-inch heavy welded lines and 12- to 16- and 20-inch concrete coated lines running from the offshore tanker mooring to the receiving tank farm. They are provided by the Corps of Engineers as part of the equipment in marine terminal installation (*c* below) and should be designed to unload T2 tankers in 24 hours. Table 8–29 provides petroleum, oil, and lubricant (POL) pipeline construction requirements.

Table 8–29. POL Pipeline Construction Requirements

1	1 Type	2 STON	3 MTON	4 Man-hours	5 Rate of construction (km per day)
2	4-in by 12.9-km with 355–BPH pump station	185	221	4, 790	12. 9
3	6-in. by 27-km with 785–BPH pump station	571	893	10, 600	12. 6
4	8-in. by 27-km with 1,355–BPH pump station	589	1, 574	11, 470	8. 4

c. Tank Farms.

(1) To determine the amount of tank farm construction required in a theater of operations, the planner first determines the required theater level of supply. This may vary from a 30- to 60-day level, depending on the distance of tanker haul and probability of tanker losses through enemy action. Using the planning factor stated in paragraph 7–15, the amount of construction required may be estimated by the following formula:

Number of divisions (plus air support) × 6,000 barrels per day × number of days of level of supply − available existing storage in theater = total storage construction requirement.

(2) Table 8–30 provides data for estimating tank farm construction along a pipeline system. These data include tanks, pipe manifolds to the individual tanks, pumps, valves, etc., necessary for operation of the tank farms. Current doctrine for dispersion of facilities prescribes that not more than 250,000 barrels of bulk storage capacity will be constructed within 6.5 kilometers of another tank farm. Marine terminals listed in the table are used at ports or beaches and include the receiving of tankers and pumping petroleum products to the tank farm.

d. Pipeline Communications. A petroleum distribution system requires continuous communications between tank farm dispatchers, pump station operators, and pipeline patrol units. The Signal Corps provides both radio-voice and teletypewriter equipment for this communications system. Teletypewriter is used primarily for hourly recording of the flow of products along the pipeline and transmission of dispatching instructions between tank farms (para 4–24).

e. Pipeline Operations.

(1) *General.* Pipeline systems for distributing bulk petroleum fuels in the theater are operated by petroleum groups under the operational control of the TASCOM supply and maintenance command. Petroleum installations extend as far forward into the combat zone as possible. Liquid petroleum fuels can be moved most effectively and economically in bulk form. The distribution plan calls for maximum use of pipelines. Distribution of packaged petroleum fuels (5-gallon cans and 55-gallon drums) is restricted to the extent essential for adding flexibility to the system. Containers of POL smaller than 55-gallon drums are palletized when shipped to air terminals for subsequent air-landed delivery.

(2) *Supervisory and operating organizations.*

(*a*) *Supervisory.* The following organizations are supervisory:

1. Headquarters and headquarters detachment, quartermaster petroleum group (TOE 10–202). Normal requirements are one per military petroleum distribution system operated by two or more petroleum operating battalions and one per two to five separate military petroleum distribution systems, each operated by a petroleum operating battalion. May be assigned to field army or higher headquarters for petroleum logistic plan-

Table 8–30. POL Tank Farm Construction Requirements

1	1 Installation	2 Capacity (M bbl)	3 Site area (sq m)	4 STON	5 MTON	6 Man-hours
2	Marine terminal, with submarine pipeline	200	110, 000	1, 454	2, 453	49, 280
3	Marine terminal, with jetty	200	----------	1, 783	2, 713	56, 180
4	Marine terminal, with existing dock	200	----------	1, 101	2, 034	43, 580
5	Marine terminal, with submarine pipeline	400	186, 000	3, 452	6, 740	113, 590
6	Marine terminal, with jetty	400	----------	3, 493	6, 660	115, 830
7	Marine terminal, with existing dock	400	----------	2, 811	5, 981	103, 230
8	Marine terminal, with submarine pipeline	1, 000	440, 000	6, 650	13, 147	242, 800
9	Marine terminal, with jetty	1, 000	----------	6, 692	13, 067	245, 040
10	Marine terminal, with existing dock	1, 000	----------	6, 010	12, 389	232, 440
11	Tank farm, with 6-in. pipeline and accessories	50	42, 000	372	575	12, 975
12	Tank farm, with 8-in. pipeline and accessories	50	----------	397	610	13, 621
13	Tank farm, with 6-in. pipeline and accessories	100	74, 000	635	992	20, 963
14	Tank farm, with 8-in. pipeline and accessories	100	----------	670	1, 047	21, 933
15	Tank farm, with 8-in. pipeline and accessories*	150	75, 000	917	1, 450	29, 660
16	Tank farm, with 8-in. pipeline and accessories*	200	76, 000	7, 031	872	33, 695
17	Tank farm, with 12-in. pipeline and accessories*	200	----------	7, 801	1, 033	34, 689
18	Tank farm, with 8-in. pipeline and accessories*	250	102, 000	1, 420	2, 228	45, 025
19	Tank farm, with 12-in. pipeline and accessories*	250	----------	1, 585	2, 514	46, 295
20	Tank farm, with 6-in. pipeline and accessories	400	152, 000	2, 642	4, 186	81, 155

*Using 10,000-barrel bolted steel tanks.

ning and coordination before the establishment of a COMMZ.

2. Headquarters and headquarters company, petroleum operating battalion (TOE 10–206). Normal requirement is one per petroleum port of entry.

(*b*) *Operating.* The quartermaster petroleum supply company (TOE 10–477) is described in table 5–65. The petroleum operating company (TOE 10–207) operates four pump stations for a 6- or 8-inch multiproduct line on level terrain. This constitutes the operation of approximately 100 kilometers of pipeline. This company operates a tank farm on a 24-hour basis for storage of from 100,000 to 500,000 barrels of bulk petroleum. Complex consists of two tank farms each with a storage capacity of from 50,000 to 250,000 barrels.

8–11. Nuclear Powerplants

a. General.

(1) Nuclear powerplants operate for extended periods without refueling, thereby eliminating the need for a continuous fuel supply. Nuclear reactors can operate for from 1 to 2 years at full power between refueling.

(2) Another military advantage of nuclear powerplants is their capability to operate independently of combustion air, which makes them suitable for use in underground installations and hardened sites. The capability of nuclear powerplants to respond quickly to large load changes insures precise power over a wide range of load demands.

(3) Disadvantages of nuclear powerplants are the high initial cost, the requirements for protection against radiation hazards, and the special handling required to dispose of radioactive wastes.

(4) Military nuclear powerplants presently in use are pressurized water reactor systems. These systems consist basically of the primary loop and the secondary loop. The primary loop converts the heat generated from nuclear fission in the reactor to steam in the secondary loop through a tube-in-shell heat exchanger. The thermal energy is converted to mechanical energy by a Rankine-cycle steam turbine, which drives an electric generator. In a pressurized water reactor system the primary loop water is maintained above saturation pressure to prevent boiling. Another type of reactor system that is widely in use by industry is the boiling water system. In this system the reactor is maintained at saturation pressure, and the water is allowed to boil in the reactor ves-

sel. The steam generated in the reactor is directed to the turbogenerator by natural circulation. The heat is rejected by a steam-condensing condenser, which is cooled by water taken from a river, lake, sea, or deep well. In arid areas the heat is rejected by airblast coolers. The steam generated can also be used in space heating and desalination of sea or brackish water to provide potable water. Nuclear powerplants can be operated in environmental temperatures between −65° and +100° F.

b. Station Powerplants. Permanent nuclear powerplants capable of electrical outputs of up to 2,000 kilowatts are presently in operation to provide steam and electricity to permanent camps and stations.

c. Portable Powerplants. Portable powerplants, also capable of producing electrical power up to 2,000 kilowatts, are the most readily adaptable to military requirements in remote areas. Prepackaged in the United States, these plants can be transported by air to any location in the world and set up for operation within 90 days after arrival on site. At the close of semipermanent operation they can be relocated for use elsewhere.

d. Mobile Powerplants. A barge-mounted nuclear powerplant with electrical output of 10,000 kilowatts is operational. A floating powerplant, because of its mobility, is particularly attractive for military applications. To enable interconnection with most foreign or domestic systems, the generating system is designed for 50 and 60 cycles, with variable taps on the transformer to obtain the required voltages. Design studies have been completed for barge-mounted nuclear powerplants that have the capability of 50,000-kilowatt electrical output and a million and a half gallons of potable water. These high-powered barges can support coastal support bases accessibly by a vessel of less than 20-foot draft. The power output from these floating powerplants can be transmitted to the shore by an aerial cable while the barge is moored at the pier or by submarine cables when it is anchored offshore.

e. Cost. The initial cost of a nuclear powerplant is relatively high when compared with a fossil-fuel steamplant or internal-combustion-engine powerplant. This high cost is due to the high standards under which the components are manufactured and the numerous safety features required to insure a reliable and safe operating plant. Nuclear powerplants are economically competitive with other energy sources when the fuel cost is excessive due to inaccessibility, e.g., in remote sites or in underground facilities where extensive excavation is required for fuel storage.

f. Construction. Construction of a stationary plant takes no longer than that of a conventional plant of the same capacity. A portable plant can be designed, manufactured, and tested for installation in a remote site in 3 years. A barge-mounted nuclear powerplant can be built in 4 years.

g. Operators. Nuclear powerplant operators are a carefully selected group of career service enlisted men. Each nuclear powerman specializes as a maintenance technician in mechanical, electrical, or instrumenation areas or as a health physicist.

h. Maintenance. Maintenance requirements for standard power components are similar to those for other steam powerplants. However, because of the radiation hazard associated with the nuclear powerplants, the reactor must be shut down for maintenance on the nuclear system. As a result, when high reliability is essential, redundant systems are provided to permit maintenance during operation without affecting plant performance. The reactor also must shut down periodically for refueling.

i. Health and Safety. Policies regulating Army nuclear reactor system health and safety procedures are in AR 385–80.

j. Summary. Nuclear power provides distinct logistic, operational, and, under certain applications, economic advantages over conventional systems in military applications. Although high initial cost is currently a deterrent to widespread use, technological advances continually reduce the initial investment and promise competitive status in the foreseeable future. In tactical situations where logistic considerations outweigh costs, there are definite advantages for the use of nuclear power. Only nuclear power can meet the demands for reliable and extended operation in underground installations, where operations must be independent of a continuous fuel supply or the earth's atmosphere.

8–12. Airfield Construction

a. Construction Effort Required for Airfields in a Theater of Operations. This paragraph is useful

for broad planning purposes only. It provides estimates for computing engineer troop support required to construct U.S. Army and Air Force installations in oversea theaters. None of the factors in this section are suitable for the detailed planning required for construction of specific installations. Detailed planning data are contained in TM 5–330.

(1) *Army airfields.* Table 8–31, extracted from TM 5–301, shows the man-hours required to construct hasty airfields (standard 4) and deliberate airfields (standard 5).

Table 8–31. Army Airfield Construction Requirements

1	1 Type	2 Number of aircraft	3 Man-hours	4 Number of aircraft	5 Man-hours	6 Number of aircraft	7 Man-hours	8 Number of aircraft	9 Man-hours
		Hasty airfields—standard 4							
2	Steel frame and pierced-steel plank	5	18, 340	15	23, 230	25	34, 230	50	63, 670
3	Steel frame and vinyl cloth		14, 500		17, 480		26, 470		46, 510
4	Wood frame and pierced-steel plank		18, 990		24, 070		35, 070		64, 940
5	Wood frame and vinyl cloth		15, 150		18, 320		27, 310		47, 780
		Deliberate airfields—standard 5							
6	Steel frame	5	79, 640	15	92, 170	25	154, 350	50	232, 190
7	Wood frame		80, 550		93, 080		155, 310		233, 460

(*a*) Standard 4 provides minimum facilities for operation and maintenance for a period of from 6 to 12 months. Concrete floors of 102-millimeter thickness are provided for maintenance and supply and 51-millimeter thickness for other buildings.

(*b*) Standard 5 provides all-weather operational facilities for a period of more than 12 months. Concrete floors of 152-millimeter thickness are provided for hangars, 192-millimeter thickness for warehouse and cargo, and 51-millimeter thickness for other buildings.

(*c*) Both standards provide for takeoff, landing, servicing, fueling, and parking of fixed- and rotary-wing aircraft and for all accommodations in buildings.

(2) *Air Force airfields.* Table 8–32 gives the average number of engineer Construction Battalion months required to accomplish emergency, minimum, and full operational construction of different types of bases. A factor of 75 percent of total construction of a new base can be used to estimate the average construction required to reconstruct an existing base or to use a site where an airfield of some type exists or has existed. The battalion months in the table are not applicable to extreme climatic conditions and mountainous or swampy terrain. Critical aircraft (col 2) are those aircraft that require the longest runway in each category.

(3) *Battalion month estimates.* The number of engineer construction battalion months to construct the different types of bases is calculated from the man- and equipment-hour workload needed to build each base. This is determined by specifying for each type of base the kinds and numbers of facilities required for the performance of the function of the units supported by the base, i.e., Airways and Air Communications Service (AACS) station, housing, and runway. Each of these facilities is broken down into the kinds and numbers of elements composing it, i.e., paved surfaces, shops, messhalls, and latrines. A man- and equipment-hour factor, such as 1.75 hours per square meter of paved surface, is then applied to each of these elements to compute the total man-hours required to construct each element. The number of hours for all elements are added to give the total man- and equipment-hours required to construct the base. This total is converted to CB months by the factor 125,000 man- and equipment-hours of construction is equivalent to 1 engineer construction battalion month.

Table 8-32. Battalion Months To Construct New Air Force Airfields

1	1 Type of base	2 Critical aircraft	3 Runway minimum length (m)	4 Emergency operational	5 Minimum operational	6 Full operational
2	Tactical (COMMZ)	F-4C	2,440			
		F-105				
3	One wing			6.5	10.0	14.5
4	One squadron			5.5	9.0	12.5
5	Heavy lift (COMMZ)	C-141	3,050			
		C-124				
6	One wing			10.0	12.5	17.0
7	One squadron			9.0	11.0	14.5
8	Medium lift (COMMZ)	C-130	1,830			
9	One wing			3.0	6.5	14.0
10	One squadron			2.0	4.5	7.5
11	Troop carrier, assault (corps or FASCOM)	CV-2	460			
12	One squadron			1.5	3.0	5.5

b. Conversion of Battalion Months of Effort to Engineer Construction Battalion. To compute manning, training, and equipping requirements, it is necessary to convert engineer construction battalion months as given above to the number of construction battalions required. Thus, a construction task requiring 8 engineer construction battalion months can be accomplished by one engineer construction battalion working for 8 months, two construction battalions working for 4 months, or four construction battalions working for 2 months. In emergencies, immediate and urgent requirements may develop for the construction of complex installations, e.g., a heavy bomber base. Theoretically, this could be done by concentrating enough construction battalions in the area to perform the required number of months of construction. However, the effect of oversaturation is involved in that the efficiency of the work diminishes as the personnel, equipment, and supplies of the different construction battalions create interference. On the basis of these saturation considerations, table 8-33 presents estimates of the number of engineer construction battalions that can be used most efficiently.

8-13. Signal Construction Factors

a. Estimated Time Required for Linework Operations. The time factors listed in table 8-34 are maximum for any operation. However, buried construction does not cover operations in jungle, arctic, or desert areas. In ground surface construction operations (lines 31 and 32), add 7.4 man-hours per kilometer for spiral-4 and 3.7 man-hours per kilometer for wire, WD-1/TT, to cover surveying, staking line, testing sections, and policing.

Table 8-33. Engineer Construction Battalion Employment

1	1 Battalion months of construction effort required	2 Optimum number of battalions best employed
2	25-35	4
3	15-24	3
4	5-14	2
5	Fewer than 5	1

b. Characteristics of Round Telephone Poles. In table 8-35 the northern and western cedars indicated are butt treated; pine is treated full length. An estimate of the shipping space required for poles is—

$$\frac{\text{Average weight (pounds)} \times \text{constant}}{40} = \text{measurement tons.}$$

Values of the constant are—

Cedars = 0.052.

Pine = 0.026.

Table 8-34. Estimated Time Required for Linework Operations

1	1 Operation	2 Man-hours placing	3 Man-hours removing
	Laying out and staking line open wire:		
2	150-m span—km	5.50	----------
	Material distribution:		
3	Lightweight metal poles—each	0.30	----------
4	Round wooden poles—each	0.50	----------
5	Wire and accessory materials, 150-m span—4 pr—km	2.30	----------
6	Insulated wire and accessory materials—150-m span—km	1.30	----------
7	PVC cable and accessory materials—per reel	1.80	----------
	Holes—pole:		
8	Dug by hand—per hole	2.00	----------
9	Dug by machine—per hole	0.50	----------
10	Dug by blasting, hand drilling—per hole	5.00	----------
	Holes—anchor:		
11	Dug by hand—4 by 4 log—each	3.00	----------
12	Dug by machine—log or plank—each	0.70	----------
13	Dug by machine—patent—each	0.80	----------
14	Dug by hand—⅝-in. rock—each	3.00	----------
	Assembling hardware and placing crossarm—open wire:		
15	Lightweight metal—four pins—each	0.30	0.20
16	Round wooden poles—eight pins—each	0.50	0.20
	Setting poles (erecting, backfilling, and tamping):		
17	Lightweight metal—each	0.40	0.30
18	20-ft round—each	1.50	1.00
19	30-ft round—each	2.00	1.20
	Guying:		
	Placing anchor and backfilling:		
20	Lightweight metal poles—each	0.60	----------
21	Round pole log or plank—each	1.80	----------
22	Patent—each	1.00	----------
	Placing and tensioning guying:		
23	W-145, 109 GS, or similar—each	0.80	0.40
24	Wire messenger, 2.2M—each	1.50	0.40
25	Wire messenger, 6M or 10M—each	1.50	0.80
	Installing line wire (placing, sagging, and tying in):		
26	One pr—km	15.50	8.10
27	Four pr—km	25.00	11.20
	Placing PVF-covered cable on messenger:		
28	11 to 101 pr—km	78.00	50.00
29	More than 101 pr—km	102.00	72.00
30	Placing insulated wire on existing pole line—km	7.40	4.40
	Ground surface construction:		
31	Spiral-4—km	1.60	1.60
32	Wire, WD-1TT, or similar—km	0.95	0.62
	Buried construction (using cable plow, LC-236( )/MT):		
	Spiral-4:		
33	One cable—km	5.30	1.90
34	Two cables, same trench—km	6.20	2.50
35	Jute-covered, tape-armored—km	28.10	42.00
36	Constructing overhead crossing for insulated wire—each	5.20	----------

Table 8-35. Characteristics of Round Telephone Poles (American Standard)

1	Class		1	2	3	4	5	6	7
2	Minimum top circumference (in)		27	25	23	21	19	17	15
3	Transverse breaking loads (lb)		4,500	3,700	3,000	2,400	1,900	1,500	1,200
	Type	Length (ft)	Approximate average weight (lb)						
4	Western cedar	20	700	600	500	400	300	225	200
5	Northern cedar	20	720	600	540	350	300	230	190
6	Creosoted pine	20	635	555	479	418	353	310	259
7	Western cedar	25	850	720	600	480	400	320	250
8	Northern cedar	25	1,020	780	600	515	420	300	250
9	Creosoted pine	25	898	808	686	602	508	423	362
10	Western cedar	30	1,000	850	730	610	500	420	350
11	Northern cedar	30	1,320	1,170	870	630	520	420	350
12	Creosoted pine	30	1,241	1,076	921	780	672	573	489
13	Western cedar	35	1,200	1,000	850	750	650	560	470
14	Northern cedar	35	1,620	1,380	1,060	820	720	510	450
15	Creosoted pine	35	1,603	1,410	1,213	996	865	733	616

c. Telephone Operational Date. Telephone operational data are included in (1) through (4) below. Space requirements are included in table 8-36.

(1) *Commercial-type telephone switchboard capacity—position comparison.*

Toll switchboard capacity—lines	*Positions*
100	15
200	25
300	34
400	40

(2) *Local (common battery manual) call handling time and traffic distribution.*

(*a*) *Call handling time.*

One operator handles 150 calls per operator hour.

Two operators handle 200 calls per operator hour.

Three operators handle 220 calls per operator hour.

Four operators handle 225 calls per operator hour.

Five operators handle 230 calls per operator hour.

(*b*) *Distribution of traffic* (average situation).

	Percentage
Local calls	40
Outgoing trunk calls	30
Incoming trunk calls	30

(3) *Toll (common battery manual) call handling time and traffic distribution.*

(*a*) *Call handling time.*

One operator handles 20 calls per operator hour.

Two operators handle 25 calls per operator hour.

Three operators handle 30 calls per operator hour.

Four operators handle 35 calls per operator hour.

Five operators handle 40 calls per operator hour.

(*b*) *Distribution of traffic* (average situation).

	Percentage
Outward	55
Inward	30
Through (switchboard)	15

(4) *Normal telephone instrument requirements* (combat units).

(*a*) One per general officer.

(*b*) One per two field grade officers.

(*c*) One per four company grade officers.

(*d*) One per 50 or 100 enlisted men, depending on whether troop basis is on TOE basis or personnel are operating as part of a large headquarters staff.

(*e*) One per 50 or 100 square feet of office space.

Table 8–36. Space Requirements—Communications Facilities

a. Common Battery Manual Telephone Switchboard (Fixed Plant)

1	1	2	3
	Line capacity	Switchboard positions	Space requirements (sq m)
2	100	1	42
3	100	2	49
4	200	2	55
5	200	4	70
6	400	7	130
7	600	10	160
8	800	11	172
9	1, 000	14	195
10	1, 200	16	212
11	1, 600	22	294
12	2, 000	27	294
13	2, 800	40	396
14	3, 600	60	498

b. Dial Central Office

1	1	2	3	4
	Line capacity		Approximate space requirements	
	Initial	Expendable to—	Dimensions (m)	Area (sq m)
2	200	400	9. 2 by 16. 7	153
3	400	600	9. 7 by 16. 7	193
4	600	1, 000	10. 7 by 21. 3	228
5	1, 000	1, 400	10. 7 by 25. 0	266
6	1, 400	2, 000	12. 2 by 29. 0	353
7	2, 000	3, 000	13. 7 by 33. 5	460
8	3, 000	4, 800	14. 9 by 36. 3	540

c. Fixed Communications Center

1	1	2
	Size	Space requirements (sq m)
2	Small	88
3	Medium	177
4	Large	280

d. Fixed Radio Transmitter Station

1	1	2	3
	Size	Number of transmitters	Space requirements (sq m)
2	Small	Up to 7	Up to 280.
3	Medium	8 to 17	280 to 1,200.
4	Large	More than 18	1,200 and up.

e. Fixed Radio Receiver Station

1	1	2	3
	Size	Number of receivers	Space requirements (sq m)
2	Small	Up to 15	Up to 370.
3	Medium	16 to 45	370 to 740.
4	Large	More than 46	740 and up.

f. Antenna Field*

1	1	2
	Type	Space requirements (M sq m)
	Transmitter:	
2	Small (5 to 7 antennas)	60 to 100.
3	Medium (15 antennas)	180 to 300.
4	Large (25 to 35 antennas)	400 to 1,600.
	Receiver:	
5	Small (8 antennas)	140 to 200.
6	Medium (25 to 30 antennas)	800 to 1,200.
7	Large (50 to 60 antennas)	1,800 to 2,400.

*Space is based on average conditions existing. However, space requirements may vary, depending on type of antennas, equipment used, location, and terrain.

Section III. MAINTENANCE

8–14. General

This section contains maintenance planning data for staff officers on division, corps, field army, army group, theater army, associated support commands, and theater staffs in a theater of operations.

8–15. Maintenance Control

a. General. This paragraph outlines a workload control system designed to determine whether an item can be repaired at the direct support (DS) maintenance level or whether it must be evacuated. The system sets forth the means of computing and controlling the maintenance backlog and general policies applicable thereto. The workload control system is a managerial tool used to balance actual workload against the workload that a maintenance facility is capable of assuming. It is intended as a guide only and is flexible in application. The system is based on the fact that a maintenance facility has a certain number of man-hours to expend on accomplishment of its mission during a given pe-

riod of time and the workload should, in general, be limited to that capacity. This permits the programing of work to allow maximum concentration on a large number of small jobs, if required; a smaller number of large jobs, if desired; or any combination of both.

b. Objectives. The objectives of the workload control system are as follows:

(1) To establish a criterion or factor, in terms of man-hours, that can be used in determining whether an item can be repaired at the DS maintenance level or whether it must be evacuated.

(2) To establish, in terms of man-hours, the unit production potential.

c. Value. The fundamental principle of DS maintenance is to repair and return items of materiel to service as rapidly as possible. The capability of a unit to perform in this manner is limited by the type and quantity of tools, quality of personnel, and available production time. The value of the system is in its ability to relate these factors and determine the unit capacity.

d. Factors. The workload control system uses the following computations, which make up the basic factors on which it is based:

(1) *Man-hours.* The man-hour computation is made by deriving the total number of man-hours actually available from the total number of man-hours theoretically available. For example, a repair section has 11 productive item repair personnel assigned. Since it normally works 12 hours per day, there are theoretically 132 item repair man-hours available (12×11). Department of the Army policy and local conditions determine percentages that must be deducted from this total to arrive at the number of man-hours actually available. These percentages cover such nonproductive operations as movement time, administrative activities, maintenance of operating equipment, or other contingencies and will vary, depending on the function or work activity involved. As a hypothetical example, an item repair section might actually have available 76.6 man-hours per day for the function of repair.

(2) *Workload.* Higher headquarters normally prescribes the workload, expressed in days, authorized to be on hand in the company (or section) at any one time. This usually represents the maximum number of days in which the company should complete the items scheduled for repair. When multiplied by the actual number of man-hours available each day, it represents the total number of actual man-hours available to the company (or section) for a given period of time. For example, if the prescribed workload is 3 days, the total number of actual item repair man-hours available to the section is 229.8 (3×76.6).

e. Utilization. Utilization of the workload control system in a repair section of a DS maintenance company is described below. The first example illustrates application when a standard repair time factor is available. The second illustrates application when the repair time factor has not been established.

(1) *Example 1.* The standard repair time factor for the repair of an item is 0.5 man-hour. The prescribed maximum workload for the section is 3 days (229.8 man-hours). Based on the standard repair time factor, the section can repair 459.6 items in the 3-day period. The section has on hand maintenance requests covering a total of 314 items. A new maintenance request (number 5) is received covering 50 items, or requiring 25 man-hours to complete the job.

(*a*) The workload control system is applied by subtracting the total number of items on hand from the total number that can be repaired in the prescribed 3-day limit ($459.6 - 314$). The resulting figure of 145.6 items indicates that maintenance request number 5 can be completed in the 3-day limit.

(*b*) If the calculation had indicated that maintenance request number 5 could not be completed in the 3-day limit, the company may have either evacuated the job to the next higher maintenance unit or assigned the job to the section with the understanding that additional jobs would have to be evacuated until the number of items on hand had been reduced.

(2) *Example 2.* A standard repair time factor has not been developed for the repair of a certain item. The prescribed maximum workload is 3 days (229.8 man-hours). The section has on hand 12 maintenance requests for the repair of items requiring an estimated 210 man-hours to complete. A new maintenance request (number 13) requiring an estimated 25 man-hours to complete is received.

(*a*) The workload control system is applied, in this instance, by subtracting the total number of man-hours required to complete the jobs on hand from the total number of man-hours actually available (229.8−210). The resulting figure of 19.8 man-hours indicates that maintenance request number 13 cannot be completed in the 3-day limit.

(*b*) The company may therefore evacuate the job to the next higher maintenance unit or assign the job to the section with the understanding that no additional jobs can be accepted until the total number of man-hours of work has been reduced.

8–16. Operational Readiness Float and Direct Exchange Criteria

a. Operational readiness float comprises those end items or major components of mission essential, maintenance significant equipment authorized for stockage, normally by direct and general support maintenance units or activities to replace unserviceable equipment or meet operational requirements. Float items normally will be positioned at the supporting direct and general support maintenance units or activities. Operational readiness float will be provided for issue as replacement for unserviceable, economically reparable equipment to meet operational commitments, provided the equipment cannot be repaired in time to meet operational requirements. It will be provided also to oversea organization commanders and CONUS strategic and air defense organization commanders on a loan basis for items lost, destroyed or determined to be uneconomically reparable (AR 750–1). However, this procedure applies only when the supply delivery date is determined to be after the operational need date. When a float item is loaned under these conditions, the user is responsible for requisitioning a replacement item and returning the float item to the support unit. An operational readiness float will be provided in support of priority units before equipment is issued to lower priority units. Direct and general support maintenance units or activities will be authorized sufficient mechanics and transportation in the TOE or TDA to maintain and transport the operational readiness float in accordance with mission-prescribed mobility. Guidance for establishing operational readiness floats is contained in appropriate Department of the Army supply bulletins.

b. Table 8–37 gives the operational readiness float authorizations recommended for selected types of equipment in DS maintenance units and activities. The factors are percentages of the total equipment supported by the maintenance activity and are subject to modification by the command concerned, depending on location, activity, and the supply station.

c. Criteria for direct exchange replacement are expressed in the number of days an unserviceable item may remain in the maintenance facility without being repaired until it is exchanged and replaced by a like item from the operational readiness float stock of the maintenance facility. These criteria are established and modified as necessary by policy of the Department of the Army and commands concerned, with recommendations and guidance from the technical services. For example, the following general policy is used for the establishment, stockage, and operation of direct exchange of repair parts and assemblies for major items of ordnance equipment:

(1) Items that have a high mortality rate and are reparable by cleaning, adjusting, or by use of repair kits may be placed on a direct exchange basis with using units.

(2) When a new operation is begun or a new item is added to the direct exchange list, 25 percent of the authorized unit stockage is used. This percentage factor may be increased or decreased as the activity or demands dictate. At no time should an excess of 75 percent of unit stockage be placed in the direct exchange section.

(3) Direct exchange activities must be reviewed each 30 days to adjust the stockage. As demands decrease, the stockage should also decrease. Seasonal fluctuations in the demand for some items will affect direct exchange stockage, i.e., cause the direct exchange section to be overstocked or understocked. The 75- to 25-percent remaining stockage in the technical supply section is a buffer to replace items salvaged by the repair shop and deadlines caused by insufficient serviceable items in the direct exchange section.

(4) The data in table 8–38 should be used as a guide in exchanging operational readiness float items of equipment other than guided missiles and heavy rockets.

Table 8–37. Operational Readiness Float Authorizations

1	2	3
Line item number	Item or type of equipment	Operational readiness float (percentage)
B83582	Boat, brg erection, inboard eng, aluminum, 27-ft, gas-driven	10
F43414	Crane-shovel, trk-mtd, 20-ton	10
J36109	Genr set, diesel-driven, 30-kw	10
J38301	Genr set, diesel-driven, 60-kw	5
J50220	Genr set, ptbl, gas-driven, 10-kw	5
J74852	Grader, road, mtz, diesel-driven	10
L76488	Loader, scoop-type, diesel-driven, 4-wheel, 2½-yd	5
N34334	Outboard motor, 25-BHP	5
S35741	Saw, chain, gas-driven, 18-in	10
W77090	Tractor, full-tracked, diesel-driven, hv DBP	15
W80515	Tractor, full-tracked, diesel-driven, lt DBP	5
W80926	Tractor, full-tracked, diesel-driven, mdm DBP	15
W95400	Tlr, cargo, ¼-ton	3
X40009	Trk, cargo, 2½-ton	10
X62340	Trk, van, shop, 2½-ton	3
D10990	Carrier, cargo, amph, tracked	4
D12086	Carrier, pers, full-tracked, armd	9
H55432	Fire con sys, AD	10
J96819	Gun, AD, SP, 40-mm	9
K56981	Howitzer, 8-in., SP	5
K57255	Howitzer, 105-mm, SP	6
K57392	Howitzer, lt, towed, 105-mm	3
K57666	Howitzer, 155-mm, SP	6
R50680	Tank recovery veh	8
V13269	Tank, cbt, 152-mm gun	9
W76679	Tractor, full-tracked, high-speed	8
Y33616	Watch, wrist	20
C19503	Breathing apparatus, compressed-air	10
C19640	Breathing apparatus, oxygen-generating	10
F82154	Decontaminating apparatus, power-driven, trk-mtd	10
G22109	Disperser, riot control agent, hel- or veh-mtd	15
G22246	Disperser, riot control agent, ptbl	15
H50418	Filter unit, gas-particulate, hospital, six-man, 12 cfm	5
H50829	Filter unit, gas-particulate, tank, three-man, 12 cfm	10
H68063	Flamethrower, ptbl	15
J30492	Genr, smoke, mech, pulse-jet	36
K26849	Heater, water, oil	10
M11210	Mask, CBR, dog	10
S79045	Service unit, flamethrower, trk-mtd	30
H49733	Filter unit, gas-particulate, elec, motor-driven or gas-driven, 300 cfm, ABC–M6	5

Table 8–38. Equipment Downtime (Days)

1	2
Type of equipment	Downtime (days)
Combat vehicles	14.
Transport vehicles	5.
Fire control materiel	3.
Automatic weapons, air defense and towed artillery.	3.
Small arms	(Immediate exchange on all items).

8–17. Maintenance Facilities and Utilities Requirements

a. Maintenance shops range in size and scope from small-unit shops with organic maintenance responsibilities to large installations capable of complete overhaul and rebuilding of equipment. The size of the shop and the number of shop sections required are governed by the scope of maintenance activities and responsibilities, shop equipment authorized, and workload.

b. Most maintenance units are authorized sufficient equipment for their own utilities requirements. In areas where organic power equipment may be supplemented or replaced by local sources of power, planning for adequate power and lighting becomes necessary. For example, it is estimated that 1 watt per square foot of shop floor area is required for adequate overhead illumination of shop areas. Additional power must be provided for operation of shop machines and equipment, heating, and other uses.

c. Covered shop space requirements for maintenance units are given in table 8–39.

8–18. Vehicle Losses

Estimated daily losses in combat divisions of general-purpose vehicles destroyed and evacuated, number per 1,000 of actual vehicle strength, are given in table 8–40.

8–19. Units Providing Maintenance and/or Repair Parts Support of Army Materiel in the Field Army Area

a. General. Table 8–41 provides a ready reference to most types of equipment used in the field army area and the units involved in providing maintenance and/or repair parts support for this equipment. Both divisional and nondivisional units are included. Each unit is identified to indicate whether its mission is DS or general support (GS).

b. Support Capability Key. End items of equipment are indicated across the top of the table. Units providing support are indicated on the left side of the table together with their support role (DS or GS). To determine which unit provides support for a specific commodity of materiel, read across the top of the table to the column indicating the commodity of interest and down the column until the appropriate entry is found. Then, by looking to the left side of the table on the same line corresponding to the entry, determine the unit involved in providing support. Abbreviations in columns 3–19 are as follows:

DS—direct support mission.

DX—direct exchange.

GS—general support mission.

MR—complete support, including inspection, repair, and repair parts support.

Table 8–39. Maintenance Covered Shop Space Requirements

1	1 TOE	2 Unit	3 Space allowances* (sq m)	4 Overhead clearance (m)
2	3–500E	Team EA, cml maint det	84	3.66
3	3–500E	Team EB, cml maint det	186	3.66
4	8–500G	Team GC, med equip maint det	49	3.05
5	8–500G	Team GD, med equip maint det	70	3.05
6	8–667E	Army med dep	107	3.05
7	10–337G	QM air equip spt co, abn div	10,000	4.26
8	10–407G	QM air dlvr co	11,150	4.26
9	10–417D	QM air equip rep and dep co	3,000	4.26
10	10–500D	Team EA, aerial dlvr det	3,720	4.26
11	10–500D	Team EC, prcht and textile rep det	1,860	4.26
12	10–500D	Team ED, platform rep det	465	4.26
13	10–500D	Team EF, prcht packing and maint det	465	4.26
14	10–500D	Team EG, Special Forces prcht rigging det	465	4.26
15	10–500D	Team HA, fabric and lthr rep det	233	4.26
16	10–500D	Team HB, fabric and lthr rep det	465	4.26
17	10–500D	Team HC, fabric and lthr rep det	698	4.26
18	10–500D	Team HD, fabric and lthr rep det	975	2.26
19	29–134F	LE GS maint co	634	4.57
20	29–137F	Hv equip GS maint co	975	4.57
21	29–138F	Div DS maint co	910	4.57
22	29–139F	Coll, clas, and salv co	585	4.57
23	29–207F	Lt maint DS co	650	4.57
24	55–465G	Acft dep maint bn (seaborne)	3,430	----

*Does not include open storage space that the units will require to support their shop operations.

Table 8-40. Divisional Vehicle Losses (Daily)

1	1 General type of operations for the force as a whole	2 Destroyed	3 Required repair by unit maintenance section [a]
2	Infantry division in attack of fortified position	27	27
3	Infantry division in attack of deliberate organized position	16	15
4	Infantry division in attack of hastily organized position	10	10
5	Infantry division in covering, security force, retirement, or delaying action	5	5
6	Infantry division in defense of position	9	7
7	Infantry division in inactive situation [b]	3	2
8	Infantry division in pursuit	5	5
9	Infantry division in assault of hostile shore	27	30
10	Infantry division in reserve	Negligible	[c] 2
11	Armored division in attack	16	15
12	Armored division in inactive situation [b]	3	2
13	Armored division in pursuit or exploitation	5	8
14	Armored division in retirement or delaying action	5	5
15	Armored division in reserve	Negligible	[c] 2

[a] These quantities are in addition to the number in unit maintenance section each day for scheduled servicing.
[b] Forces in contact, neither side attacking.
[c] These figures do not apply during rehabilitation.

PO—repair parts only; no repair.
RO—repair only; no parts issued.

8-20. Floating Army (Aircraft) Maintenance Facility

a. General. The floating Army (aircraft) maintenance facility (FAMF) is a converted seaplane tender manned by the aircraft depot maintenance battalion (seaborne) (TOE 55-465G) and a civilian crew (Military Sea Transportation Service). The batalion is composed of a headquarters (fig. 8-1) and an operating company (fig. 8-2).

b. Mission. This battalion is a flexible and mobile unit, deployable to any part of the world on short notice, with the mission of providing aircraft maintenance support to U.S. strike forces.

c. Maintenance Capability. The battalion is capable of providing—

(1) Limited airframe repair.

(2) Aircraft turbine engine rebuild, overhaul, repair, and test.

(3) Component rebuild, overhaul, repair, and test.

(4) Extensive laboratory support.

(5) Limited manufacturing support.

(6) Certain calibration services.

(7) Evaluation of low-time components for return to service.

(8) Evaluation of all types of components for determination of disposition.

(9) Extensive test facilities.

(10) All types of disassembly, repair, and rebuild shops, to include the following facilities:

(*a*) Sheet metal.
(*b*) Welding.
(*c*) Heat treatment.
(*d*) Machine.
(*e*) Chemical cleaning.
(*f*) Fabric.
(*g*) Hydraulic.
(*h*) Instrument.
(*i*) Electrical.
(*j*) Bearing.
(*k*) Armament.
(*l*) Photographic laboratory.
(*m*) Chemical and magnetic particle inspection.
(*n*) Fluorescent penetrant.
(*o*) Inspection plating.
(*p*) Metallurgical laboratory, lab jet and reciprocating.
(*q*) Turbine engine repair (including test cells).
(*r*) Sonic cleaning.

(11) FAMF has an avionics capability of 5,700 man-hours per month.

d. Functioned Shop Capability. Table 8-42 delineates the functional shop capability of the aircraft depot maintenance battalion.

Table 8–41. Maintenance Support Capability

A. Mobility Command and Supply and Maintenance Command

1	Unit	TOE	Support role	Automotive items and related components (less tires)	Tires and tubes	Aircraft and related components	Air delivery equipment	Construction equipment	Reproduction and survey equipment	Lighting and power-generating equipment	Refrigeration and air conditioning equipment	Materials-handling equipment	Clothing and light textiles	Laundry, bath, and baking equipment	Food service equipment	Fuel-dispensing and POL equipment	Burners, fire units and heaters	Office machines	Sewing machines
	Nondivisional																		
2	Tire repair co	9-117G	GS		RO														
3	QM air dlvr co	10-407G	DS				DX												
4	Field svc GS co (fwd)	29-114G	GS									DX	RO						
5	Repair parts GS co (fwd)	29-119G	GS	PO	PO [1]	PO	PO	PO	PO	PO	PO	PO		PO	PO	PO	PO	PO	PO
6	Repair parts GS co (army)	29-119G	GS	PO	PO [1]		PO	PO	PO	PO	PO	PO		PO	PO	PO	PO	PO	PO
7	Field svc GS co (army)	29-124G	GS										RO						
8	LE GS maint co	29-134G	GS				RO		RO	RO	RO				RO		RO	RO	RO
9	Hv equip GS maint co	29-137G	GS	RO				RO				RO		RO		RO			
10	Div DS maint co	29-138F	DS	RO				RO	RO	RO	RO	RO		RO	RO	RO	RO	RO	
11	HQ and main spt co, maint DS bn	29-206F	DS	MR	PO [1]			MR	MR	MR	MR	MR		MR	MR	MR	MR	MR	MR
12	Lt maint DS co	29-207F	DS	MR	PO [1]			MR	MR	MR	MR	MR		MR	MR	MR	MR	MR	MR
13	S&S co, S&S bn, DS	29-217G	DS										DX						
14	HHC, trans acft maint and sup GS bn	55-66F	GS			PO													
15	Trans acft DS co	55-457G	DS			MR													
16	Trans acft maint GS co	55-458G	GS			RO													
	Divisional																		
17	S&S co, S&T bn	10-7G	DS										DX						
18	HQ and main spt co, maint bn, inf div	29-16G	DS	MR	PO [1]			MR		MR	MR			MR	MR	MR	MR	MR	
19	Fwd spt co, maint bn, inf div	29-17G	DS	MR	PO [1]			MR		MR	MR			[2]	[2]	[2]	[2]	[2]	
20	Trans acft maint co, maint bn, inf div	55-89G	DS			MR													

[1] Replacement tires and tubes provided as repair parts.

[2] Maintains repair parts stockage as necessary for such items, if supported. Can perform limited maintenance of a mechanical nature. Most DS maintenance provided by beadquarters and main support company.

b. Weapons Command and Electronics Command

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Unit	TOE	Support role	Artillery weapons (conventional) and fire control systems	Small arms	Nonintegrated fire control instruments	Conventional ammunition	Nuclear weapons and associated test equipment	Large missile systems	Small missile system, class II and IV components	Avionics	Aircraft armament	Communications equipment	Cryptographic equipment	Photographic and projection equipment	Electrical/electronic devices and equipment	Radiac equipment	Automatic data processing equipment	Electrical accounting machine equipment	Infrared devices	Smoke generators	Gas masks	Flamethrowers	Decontamination and protective equipment
Nondivisional																							
Ord ammo DS/GS co	9-38G	DS/GS				MR																	
Ord sp ammo DS co	9-47H	DS					PO																
Ord sp ammo GS co	9-48G	GS					MR																
Ord GM GS co	9-57G	GS						MR															
Pershing GS maint co	9-57G	DS						MR [1]															
HHC, spt group	29-102G	DS/GS											MR										
Repair parts GS co (fwd)	29-119G	GS	PO	PO	PO				PO	PO	PO	PO		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
Repair parts GS co (army)	29-119G	GS	PO	PO	PO				PO	PO		PO		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
LE GS maint co	29-134G	GS								RO		RO		RO	RO	RO	RO	RO	RO	RO	RO	RO [2]	RO [2]
Hv equip GS maint co	29-137G	GS	RO	RO	RO				RO			RO [3]							RO	RO [3]	RO	RO [3]	RO [3]
Div DS maint co	29-138G	DS	RO	RO	RO				RO			RO		RO	RO	RO			RO	RO	RO	RO	RO
HQ and main spt co, maint DS bn	29-208G	DS	MR	DX	DX														MR	MR	MR	MR	MR
Lt maint DS co	29-207G	DS	MR	DX	DX														MR	MR	MR	MR	MR
HHC, trans acft maint and sup GS bn.	55-66F	GS									PO												
Trans acft maint GS co	55-458G	GS								RO [1]	RO												
Divisional																							
Sig bn (armd div, inf div, inf div (mech)).	11-35G	DS											MR										
HQ and main spt co, maint bn, inf div.	29-16G	DS	MR	MR	MR							MR		MR	MR	MR			MR	MR	MR	MR	MR
Fwd spt co, maint bn, inf div	29-17G	DS	MR	DX	MR				MR			MR		(4)	MR	MR			MR	(4)	(4)	(4)	(4)
Trans acft maint co, maint bn, inf div.	55-89G	DS								MR	MR												

[1] Also provides DS maintenance to supported units for Tank automotive, Mobility Equipment, and Electronics Command items associated with missile systems.

[2] Except vehicular-mounted equipment.

[3] Limited repair to vehicular-mounted items only.

[4] Maintains repair parts stockage as necessary for such items, if supported. Can perform limited maintenance of a mechanical nature. Most DS maintenance provided by headquarters and main support company.

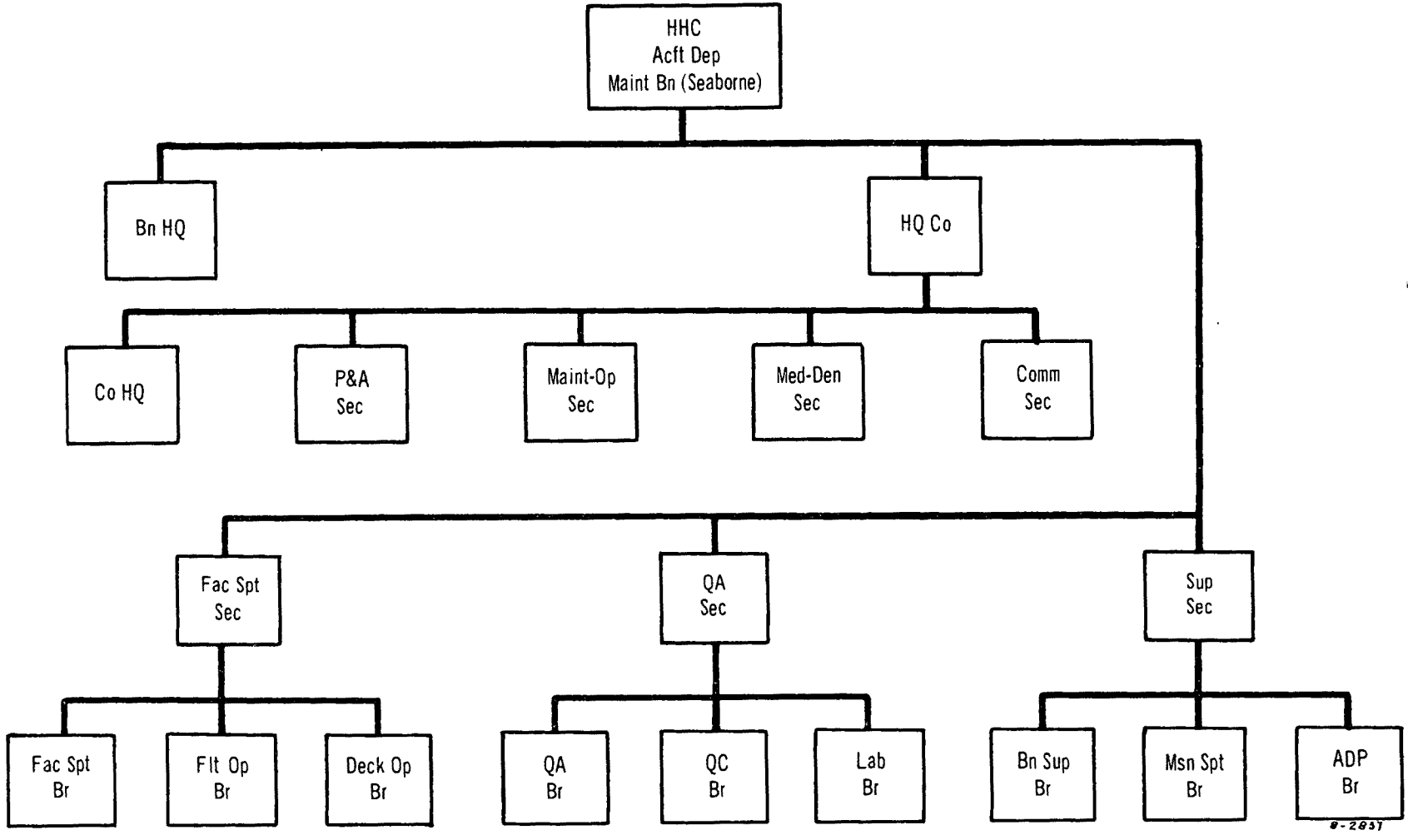


Figure 8–1. Headquarters and headquarters company, aircraft depot maintenance battalion (seaborne) (TOE 55–466G)

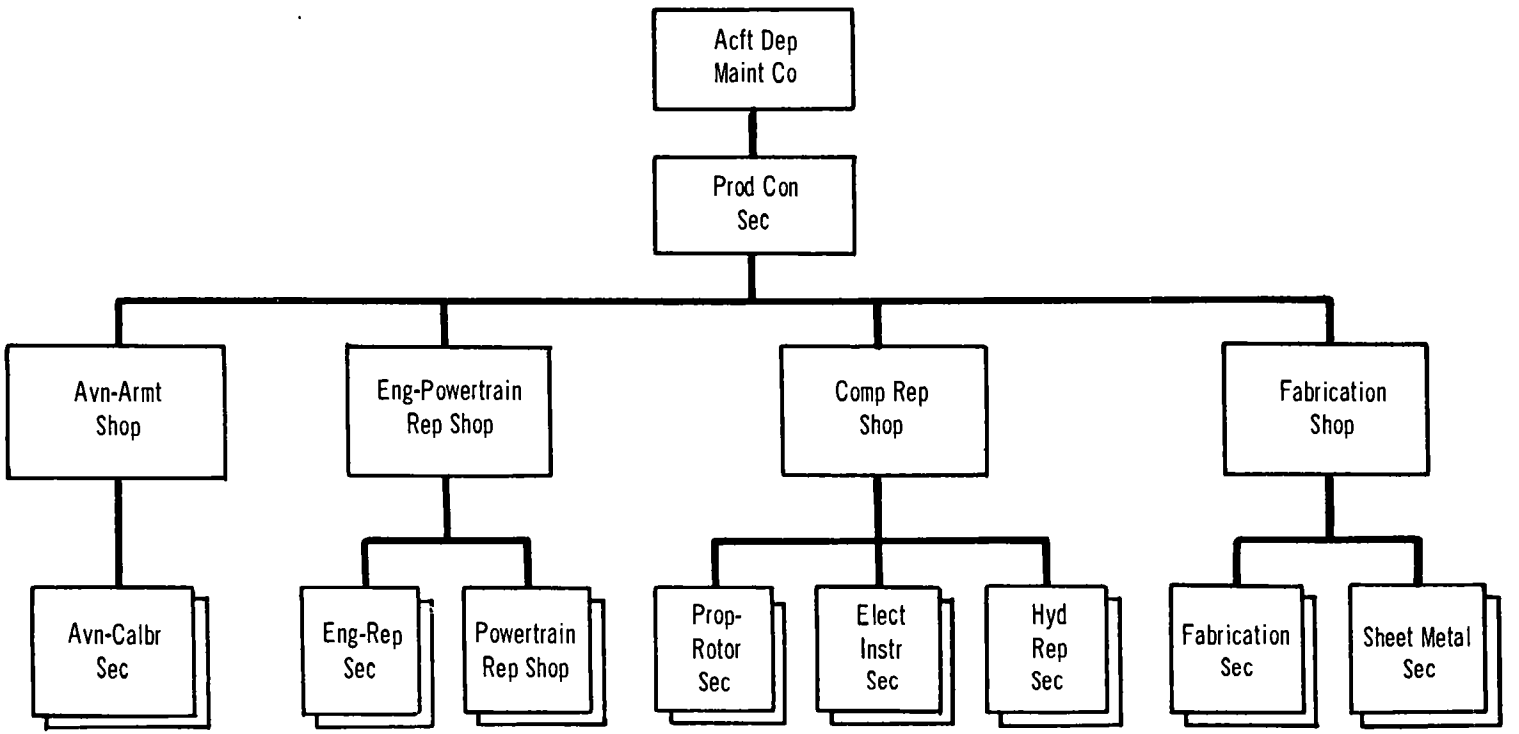


Figure 8–2. Aircraft depot maintenance company, aircraft depot maintenance battalion (seaborne) (TOE 55–467G).

Table 8–42. FAMF Functional Shop Capability

1	1	2	3	4	5	6	7	8	9
	Remark	Shop							Total
		Engine and transmission	Component repair	Support platoon	Avionics	Calibration	Armament	Parachute repack	
2	Function	Turbine engines, transmission, rotor head, and fuel system.	Propeller, rotor, electrical, hydraulic, and instrument.	Machine, sheet metal, painting, welding, and diagnostic.	Communications, navigation, and surveillance.	Electrical and mechanical.	Weapons and systems fire control.	Personnel, air delivery system, and ejection seat system.	
3	Assigned strength	54	56	38	20	6	4	4	182
4	Man-hours per month.*	15,390	15,960	10,830	5,700	1,710	1,140	1,140	51,870

*Man-hours computation: TOE strength X 240 man-hours per month X 135-percent efficiency gain—12-percent absentee loss.

e. Vessel Characteristics (Ch 7).

(1) The FAMF provides 67,000 square feet of shop space and 112,400 cubic feet of storage area. It can also transport 26 UH–1D helicopters, provide either JP–4/–5 storage for large-scale helicopter operations, produce 85,000 gallons of potable water (50,000 gallons required for ship operations), load aircraft ammunition, pack 20 parachutes daily, provide limited medical support, and function as a helicopter resupply pad.

(2) The draft of the vessel is 24 feet, which can be reduced from 3 to 4 feet when necessary; however, ship operations dictate positioning the vessel in 40 feet of water with a minimum flow rate of 4 knots when operating for a prolonged period of time. At anchor, a 60-foot water depth is desirable, with a lateral distance of 2 nautical miles to the nearest shore and a swing clearance of 500 meters when secured to a buoy.

CHAPTER 9

LOGISTICS—MANAGEMENT

Section I. GENERAL

9–1. Introduction

This chapter summarizes the detailed data on logistic planning presented in previous chapters. This summary is presented in the form of general logistic planning factors for use by staff officers at higher levels. It should be noted that these factors apply to *average* conditions and situations. They should be used only as a first approximation in logistic planning or as rule of thumb checks against the calculations of technical planners. Specific situations may require widely different factors.

9–2. Organizational Factors—Theater Slices

a. Table 9–1 summarizes data on division and air wing slices.

b. Detailed figures on slices may be found in the following paragraphs:

(1) Division slice—strengths, by assignment

Table 9–1. Division and Air Wing Slices

a. Division Slice

1	1	2	3	4	5	6
	Composition of slice by assignment of troops		Percentage of slice		Composition of slice by location of troops	
	Assignment	Troops	Theater	Combat zone	Troops	Location
2	Basic division	17, 962	34	45	24, 265	Division area.
3	Corps and field army troops	21, 743	42	55	15, 440	Corps and field army rear areas.
4	Communications zone and theater overhead	12, 250	24	----	12, 250	Communications zone.
5	Total	51, 955	100	100	51, 955	

b. Air Wing Slice

1	1	2	3	4	5
	Composition of slice by assignment of troops		Percentage of slice	Composition of slice by location of troops	
2	Air Force combat organization	2, 550	36	----	Division area.
3	Miscellaneous Air Force support units	3, 450	50	----	Corps and field army rear areas.
4	Army communications zone troops*	1, 000	14	7, 000	Communications zone.
5	Total	7, 000	100	7, 000	

*Army troops required in the theater because of the presence of Air Force elements, which are provided Army combat service support.

of troops—paragraphs 4–6 (fig. 4–1) and 4–7 (table 4–7).

(2) Air wing slice—strengths, by assignment of troops—paragraphs 4–6 (fig. 4–2) and 4–7 (table 4–8).

(3) Division and air wing slices—strengths, by location of troops—paragraph 5–23 (fig. 5–1):

(4) Division and air wing slices—supplies, by location of troops—paragraph 5–23 (fig. 5–2 and 5–6).

Section II. LOGISTIC FACTORS

9–3. Supply Factors

These factors are for use in broad initial planning. They do not include tonnages involved in buildup of theater reserves. Figure 9–1 indicates resupply factors in short tons per day for each division slice plus two air wings. Table 9–2 provides resupply factors in pounds per man per day.

9–4. Hospitalization and Evacuation Factors

The factors presented in table 9–3 are valid for conventional warfare operations only. For factors applicable to nuclear warfare, see FM 101–10–3, chapter 2.

9–5. Transportation Factors

Tables 9–4 and 9–5 are based on data in FM 55–15

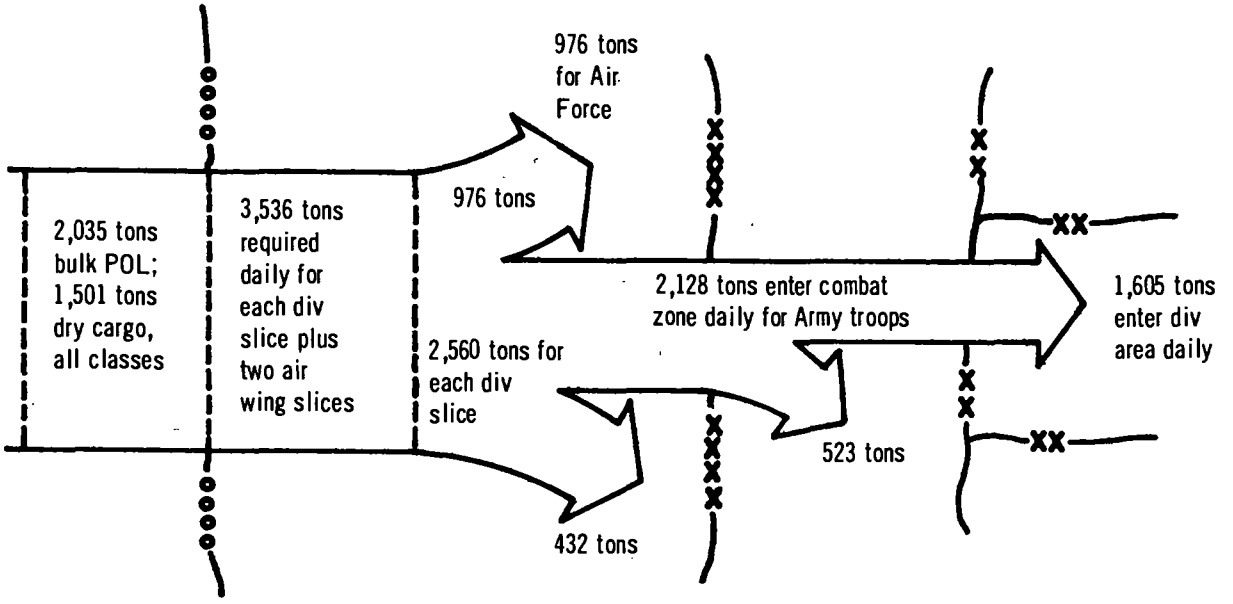


Figure 9–1. Resupply factors, short tons per day per division slice—all classes.

Table 9–2. Resupply Factors, Pounds Per Man Per Day

1	1 Item	2 Consumed per man in theater (Army plus Air Force)	3 Consumed by Army in theater, per Army man in theater	4 Consumed by Army in combat zone, per Army man in combat zone	5 Consumed by Army in division areas, per Army man in such areas
2	Bulk POL	61. 70	47. 80	53. 10	62. 60
3	Dry cargo	45. 60	48. 53	54. 07	69. 76
4	Total	107. 30	96. 33	107. 17	132. 36

and FM 55–35. These factors summarize data contained in chapter 7.

9–6. Service Factors

a. Service Troop Factors. Service troops equal approximately 40 percent of the division slice. Sixty percent of the service units are in the communications zone, and 40 percent are in the combat zone.

b. Equipment Factor. This factor is one vehicle for five to six men in a balanced force.

Table 9–3. Evacuation and Hospitalization Factors

	1	2
1	Kind of hospitalization	Quantity required
	Mobile hospitals:	
2	Evacuation, semimobile	2 per division.
3	Mobile-army surgical	1 per division.
4	Fixed-hospital beds in the theater of operations.	7 percent of theater of operation strength.

Table 9–4. Capacities of Transportation Mediums

	1	2	3	4	5
1	Medium		STON per day	LTON per day	Adequate to maintain—
2	Highways (average)	Gravel	3, 200		2 divisions.
3		Bituminous-treated	5, 800		Corps of 4 divisions.
4		Concrete	8, 400		Field army of 8–12 divisions.
5	Railways each way	Single-track	4, 000	3, 570	3 divisions.
6		Double-track	12, 000	10, 700	9 divisions.
7	Pipeline	4-in. (inside diameter)	910	810	3 divisions.
8		6-in	2, 000	1, 800	5–8 divisions.
9		8-in	3, 480	3, 100	1 typical field army.
10		12-in	18, 300	16, 430	5 typical field armies.
11	Discharge rate	Average cargo ship	720	643	½ division.
12	Across beaches	Per 1,000 m of beach	1, 860	1, 650	1 division plus.
13	Capacities of average cargo ship		10,000 MTON or 5,000 LTON of Army cargo.*		
14	Capacities of average train in theater of operations		1,000 troops or 400 STON of cargo.		

*See paragraph 7–43*n*.

Table 9–5. Transportation Requirements of the Infantry Division

	1	2
1	Type	Requirement
2	Highway	5 trans light trk companies in addition to organic transport.
3	Air	Approximately 781 C–130-type aircraft sorties and 374 C–124-type aircraft sorties are required to air-land an infantry division. This is a lift of approximately 18,000 tons. For detailed data, see FM 61–100.
4	Amphibious operation	Average strength of an *assault division*, including shore party and other attached and supporting elements, is 25,000 men with 5,000 vehicles. If 75 percent of the vehicles of the infantry division and attached and supporting elements are loaded out with the division in assault shipping, the requirements in assault shipping for a reinforced division in an amphibious operation are—

Type	Extended voyage (10 days)	Short voyage (2–3 days)
APA (transport, attack)	6	3
AKA (cargo ship, attack)	15	6
LST (landing ship, tank)	26	45
LSD (landing ship, dock)	7	16
LPH (landing platform, helicopter)	4	4

Table 9–6. Legal Services Planning Factors—Workload Per 10,000 Men

1	1 Area of responsibility	2 GCM per month	3 Claims per month	4 War crimes incidents per month	5 Legal assistance matters per month
2	Combat zone	4	25	15	50–75
3	Communications zone	6	150	10	100–150

9–7. Legal Services

a. For planning purposes, the workloads indicated in table 9–6 may be expected in oversea theaters during hostilities. Actual workloads may vary, depending on the specific oversea theater, the duration of hostilities, and the specific forces in the theater.

b. Table 9–7 lists judge advocate general (JAG) service organization detachments (teams) (TOE 27–500). These teams are theater army troops that may be employed to augment organic JAG sections when needed.

Table 9–7. JAG Service Organization Detachments

1	1 Unit [1]	2 Work unit per month
2	JAG claims svc team FA	40–50 claims.
3	JAG war crimes team GA	10–15 incidents.
4	JAG GCM trial team HA	10–15 GCM.
5	JAG GCM trial team HB	20–25 GCM.
6	JAG legal asst team IA	250–300 cases.
7	JAG procurement law teams [2]	

[1] For capabilities, assignment, strength, basis of allocation, etc., of the teams listed in this table, see TOE 27–500.
[2] See TOE 27–500.

CHAPTER 10

MISCELLANEOUS

10–1. Conversion Factors

Tables 10–1 through 10–7 list the appropriate factors to be used in performing conversions pertaining to weight; speed; power; and angular, linear, surface, and volume measurements.

10–2. Physical Constants

a. Table 10–8 lists the constants to be used in considering the speed of sound.

b. The speed of light is approximately 186,000 miles (300,000 kilometers) per second.

Table 10–1. Weight Conversion Factors

	1	2	3	4	5	6
1	Unit	Long tons	Metric tons	Short tons	Kilograms	Pounds
2	1 long ton=		1. 0160	1. 1200	1, 016. 0	2, 240. 0
3	1 metric ton=	0. 9842		1. 1023	1, 000. 0	2, 204. 6
4	1 short ton=	0. 8929	0. 9072		907. 2	2, 000. 0
5	1 kilogram=					2. 2046

Table 10–2. Speed Conversion Factors

	1	2	3	4	5	6	7	8
1	Unit	Knots	Statute miles per hour	Kilometers per hour	Feet per minute	Feet per second	Meters per minute	Meters per second
2	1 knot*=		1. 1516	1. 8532	101. 34	1. 6890	30. 89	0. 5148
3	1 mile per hour=	0. 8684		1. 6093	88. 00	1. 4667	26. 82	0. 4470
4	1 kilometer per hour=	0. 5396	0. 6214		54. 68	0. 9113	16. 67	0. 2778

*One knot—nautical mile per hour.

Table 10–3. Power Conversion Factors

	1	2	3	4	5	6
1	Unit	Kilowatts	Horsepower	Btu* per minute	Foot-pounds per second	Foot-pounds per minute
2	1 kilowatt=		1. 34100	56. 88	737. 600	44, 250. 0
3	1 horsepower=	0. 7457		42. 42	550. 000	33, 000. 0
4	BTU* per minute=	0. 01758	0. 02358		12. 968	778. 1

*BTU, or British thermal unit, is the quantity of heat required to raise the temperature of 1 pound of water 1° F.

Table 10–4. Angular Measurement Conversion Factors

	1	2	3	4	5
1	Unit	Radians	Degrees	Mils	Minutes
2	1 radian=		57. 2958	1, 018. 600	
3	1 degree=	0. 017453		17. 778	60. 000
4	1 mil=		0. 05625		3. 375

Note. 360°=2π radians=6,400 mils.

Table 10–5. Linear Measurement Conversion Factors

1	1 Unit	2 Nautical miles*	3 Statute miles	4 Kilometers	5 Cable lengths	6 Fathoms	7 Meters	8 Yards	9 Feet	10 Inches	11 Centimeters
2	1 nautical mile=	1. 1509	1. 8519	8. 439	1, 012. 7	1, 852. 0	2, 025. 4	6, 076. 115	72, 913. 0	182, 918. 3	
3	1 statute mile=	0. 8681		1. 6093	7. 333	880. 0	1, 609. 3	1, 760. 0	5, 280. 0	63, 360. 0	160, 933. 0
4	1 kilometer=	0. 5393	0. 6214		4. 557	546. 8	1, 000. 0	1, 093. 6	3, 281. 0	39, 370. 0	100, 000. 0
5	1 cable length=	0. 1183	0. 1364	0. 2195		120. 0	219. 5	240. 0	720. 0	8, 640. 0	21, 945. 0
6	1 fathom=						1. 829	2. 0	6. 0	72. 0	182. 88
7	1 meter=					0. 5468		1. 0936	3. 281	39. 37	100. 0
8	1 yard=					0. 5000	0. 9144		3. 0	36. 0	91. 44
9	1 foot=					0. 1667	0. 3048	0. 3333		12. 0	30. 48
10	1 inch=								0. 0833		2. 54
11	1 centimeter=								0. 0328	0. 3937	

*The nautical mile is the same as the International Nautical Mile. In some texts the nautical mile may appear as 6080.20 feet.

Table 10–6. Surface Measurement Conversion Factors

1	1 Unit	2 Square miles	3 Square kilometers	4 Hectares	5 Acres	6 Square rods	7 Square meters	8 Square yards	9 Square feet
2	1 square mile=		2. 59	259. 0	640. 0	102, 400. 0	2, 589, 945. 0	3, 097, 600. 0	
3	1 square kilometer=	0. 3861		100. 0	247. 1	39, 537. 0	1, 000, 000. 0	1, 196, 010. 0	
4	1 hectare=		0. 010		2. 471	395. 4	10, 000. 0	11, 960. 0	107, 641. 0
5	1 acre=			0. 4047		160. 0	4, 047. 0	4, 840. 0	43, 560. 0
6	1 square rod=						25. 29	30. 25	272. 25
7	1 square meter=					0. 03954		1. 1960	10. 764
8	1 square yard=					0. 03306	0. 8361		9. 000

c. Acceleration due to gravity is 32.2 feet (981 centimeters) per second.

d. Atmospheric pressure is 14.7 pounds per square inch (10,336 kilograms per square meter). This is equal to the pressure exerted by a column of water 33.9 feet (1,033 centimeters) high, which is the theoretical maximum height to which water may be drawn by suction.

e. The circumference of the earth at the equator is 24,902 miles (40,075 kilometers).

f. Time between moons is 29 days 12 hours 44 minutes.

Table 10–7. Volume Measurement Conversion Factors

	1	2	3	4	5	6
1	Unit	Cubic feet	Imperial gallons	U.S. gallons	Liters	Quarts
2	1 cubic foot=		6. 229	7. 481	28. 32	29. 92
3	1 imperial gallon=	0. 16054		1. 2010	4. 546	4 804
4	1 U.S. gallon=	0. 13368	0. 8327		3. 785	4. 000
5	1 liter=	0. 03532	0. 2201	0. 2642		1. 0567
6	1 measurement ton=	40. 0				
7	1 barrel (petroleum)=	5. 61		42. 0		

Table 10–8. Speed of Sound Physical Constants

	1	2	3	4	5	6	7	8
1	Unit	In air (at ° F.)					In water	
		−10°	0°	30°	70°	100°	Fresh	Salt
2	Feet per second=	1, 039	1, 050	1, 083	1, 127	1, 171	4, 700	4, 752
3	Miles per hour=	708	716	738	768	797	3, 205	3, 246
4	Centimeters per second=	31, 669	32, 004	32, 932	34, 350	35, 692	143, 256	144, 840
5	Kilometers per hour=	1, 139	1, 152	1, 188	1, 236	1, 283	5, 158	5, 224

APPENDIX A

REFERENCES

A-1. Field Manuals

FM 1-5	Aviation Company.
FM 1-10	Army Aviation Organizational Aircraft Maintenance.
FM 1-15	Divisional Aviation Battalion and Group.
FM 1-100	Army Aviation Utilization.
FM 3-8	Chemical Reference Handbook.
FM 3-10	Employment of Chemical and Biological Agents.
(C) FM 3-10B	Employment of Chemical Agents (U).
FM 5-15	Field Fortifications.
FM 5-22	Camouflage Materials.
FM 5-25	Explosives and Demolitions.
FM 5-26	Employment of Atomic Demolition Munitions (ADM).
FM 5-30	Engineer Intelligence.
FM 5-34	Engineer Field Data.
FM 5-35/AFM 88-54	Engineers' Reference and Logistical Data.
FM 5-36	Route Reconnaissance and Classification.
FM 5-144	Engineer Amphibious Units.
FM 6-20-1	Field Artillery Tactics.
FM 6-20-2	Field Artillery Techniques.
(C) FM 6-37	Field Artillery Battalion, SERGEANT (U).
(S) FM 6-39	Field Artillery Battalion (PERSHING) (U).
FM 6-56	Field Artillery Battalion, LITTLE JOHN.
FM 6-61	Field Artillery Battalion, HONEST JOHN.
FM 7-30	Infantry, Airborne, and Mechanized Division Brigades.
FM 8-15	Medical Service in Divisions, Separate Brigades, and The Armored Cavalry Regiment.
FM 8-55	Army Medical Service Planning Guide.
(S) FM 9-2A	Special Ammunition Logistical Data (Classified Data) (U.)
FM 9-6	Ammunition Service in the Theater of Operations.
FM 10-8	Air Delivery of Supplies and Equipment in the Field Army.
FM 10-13	Quartermaster Reference Data.
FM 10-20	Organization for Supply of Petroleum Products in Theaters of Operations.
FM 10-50	Supply and Transport Battalion, Division Support Command.
FM 10-60	Supply of Subsistence in a Theater of Operations.
FM 11-20	Signal Operations, Theater of Operations.
FM 11-23	U.S. Army Strategic Communications Command (Theater).
FM 11-40	Signal Corps Pictorial Operations.
FM 11-50	Signal Battalion, Armored, Infantry, and Infantry (Mechanized) Divisions.
FM 11-57	Signal Battalion, Airborne Division.
FM 11-95	Army Command Signal Operations Battalion.
FM 16-5	The Chaplain.
FM 17-1	Armor Operations.
FM 17-30	The Armored Division Brigade.

A–1. Field Manuals—Continued

FM 17–36	Divisional Armored and Air Cavalry Units.
FM 17–95	The Armored Cavalry Regiment.
FM 19–25	Military Police Traffic Control.
FM 19–30	Physical Security.
FM 19–40	Enemy Prisoners of War and Civilian Internees.
FM 20–15	Pole and Frame-Supported Tents.
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FM 23–17	REDEYE Guided Missile System.
FM 21–30	Military Symbols.
FM 24–1	Tactical Communications Doctrine.
FM 24–18	Field Radio Techniques.
FM 24–19	Communications-Electronics Reference Data.
FM 24–20	Field Wire and Field Cable Techniques.
FM 29–20	Maintenance Management in Theaters of Operations.
FM 29–22	Maintenance Battalion and Company Operations (Nondivisional).
FM 29–30	Maintenance Battalion and Company Operations in Divisions and Separate Brigades.
FM 30–5	Combat Intelligence.
FM 30–9	Military Intelligence Battalion, Field Army.
(S) FM 30–9A	Military Intelligence Battalion, Field Army (U).
FM 30–10	Terrain Intelligence.
(C) FM 30–10A	Special Applications of Terrain Intelligence (U).
FM 30–16	Technical Intelligence.
FM 31–10	Barriers and Denial Operations.
FM 31–11	Doctrine for Amphibious Operations.
FM 31–12	Army Forces in Amphibious Operations (The Army Landing Force).
FM 31–21	Special Forces Operations.
(S) FM 31–21A	Special Forces Operations (U).
FM 31–22	U.S. Army Counterinsurgency Forces.
FM 33–1	Psychological Operations—U.S. Army Doctrine.
FM 38–1	Logistics Supply Management.
FM 38–2–1	Logistics Materiel Management—Requirements.
FM 41–10	Civil Affairs Operations.
FM 44–1	U.S. Army Air Defense Artillery Employment.
(S) FM 44–1A	U.S. Army Air Defense Employment (U).
FM 44–3	Air Defense Artillery Employment, CHAPARRAL/VULCAN.
FM 44–95	Air Defense Artillery Employment, NIKE–HERCULES.
(S) FM 44–96A	Air Defense Artillery Employment, HAWK (U).
FM 54–3	The Field Army Support Command.
FM 54–4	The Support Brigade.
FM 54–7	The Theater Army Support Command.
FM 55–4	Transportation Movements in Theaters of Operations.
FM 55–6	Transportation Services in Theaters of Operations.
FM 55–15	Transportation Reference Data.

A-1. Field Manuals—Continued

FM 55-21	Transportation Railway Supervisory Units.
FM 55-22	Transportation Railway Battalions.
FM 55-35	Motor Transport Operations and Motor Transport Units.
FM 55-45	Aircraft Maintenance Services and Units in the Field Army.
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FM 55-52	Transportation Terminal Battalion and Terminal Service Company.
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FM 57-35	Airmobile Operations.
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FM 61-100	The Division.
FM 100-5	Operations of Army Forces in the Field.
FM 100-10	Combat Service Support.
FM 100-15	Field Service Regulations—Larger Units.
(C) FM 100-20	Field Service Regulations—Internal Defense and Development (IDAD) (U).
FM 101-5	Staff Officers' Field Manual: Staff Organization and Procedure.
FM 101-10-2	Staff Officers' Field Manual: Organizational, Technical, and Logistical Data; Extracts of Tables of Organization and Equipment.
(S) FM 101-10-3	Staff Officers' Field Manual: Organizational, Technical, and Logistical Data, Classified Data (U).
(C) FM 101-20	United States Army Aviation Planning Manual (U).
(S) FM 101-31-2	Staff Officers' Field Manual: Nuclear Weapons Employment Effects Data (U).
FM 105-5	Maneuver Control.

A-2. Technical Manuals

TM 3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
TM 3-250	Storage, Shipment, and Handling of Chemical Agents and Hazardous Chemicals.
TM 5-210	Military Floating Bridge Equipment.
TM 5-231	Mapping Functions of the Corps of Engineers.
TM 5-236-70	American Ephemeris and Nautical Almanac for the Year 1970.
TM 5-240	Map Compilation, Color Separation, and Revision.
TM 5-243	Cartographic Aerial Photography.
TM 5-245	Map Reproduction.
TM 5-248	Foreign Maps.
TM 5-277	Bailey Bridge.
TM 5-285	Semipermanent Highway Steel Bridges, 30-, 60-, and 90-Foot Spans.
TM 5-286	Semipermanent Highway and Railway Trestle Bridges.
TM 5-301	Staff Tables of Engineer Functional Components System.
TM 5-302	Construction in the Theater of Operations.
TM 5-303	Bills of Materials and Equipment of the Engineer Functional Components System.
TM 5-311	Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations).
TM 5-312	Military Fixed Bridges.
TM 5-330	Planning, Site Selection, and Design of Roads, Airfields, and Heliports in the Theater of Operations.

A–2. Technical Manuals—Continued

TM 5–343	Military Petroleum Pipeline Systems.
TM 5–360	Port Construction and Rehabilitation.
TM 5–370	Railroad Construction.
TM 5–372	Unit Construction Railway Bridge.
TM 5–373	Through-Truss Railway Bridges.
TM 5–374	Light Standard and Standard Unit Steel Trestles.
TM 5–700	Field Water Supply.
TM 9–500	Data Sheets for Ordnance Type Materiel.
TM 9–1300–206	Care, Handling, Preservation, and Destruction of Ammunition.
TM 9–1345–200	Landmines.
TM 9–1900	Ammunition, General.
TM 10–500-series	Airdrop of Supplies and Equipment.
TM 10–1101	Petroleum Handling Equipment and Operations.
TM 10–1619	Quartermaster Materials—Handling Equipment.
TM 30–245	Image Interpretation Handbook.
TM 30–246	Tactical Interpretation of Air Photos.
TM 38–750	Army Equipment Record Procedures.
TM 38–750–1	Maintenance Management: Field Command Procedures.
TM 55–206	Railway Train Operations.
TM 55–1510–10-series	Operator's Manual: Army Aircraft (Fixed Wing).
TM 55–1520–10-series	Operator's Manual: Army Aircraft (Rotary Wing).
TM 57–210	Air Movement of Troops and Equipment.
TM 743–200-series	Storage and Materials Handling.
TM 750–5–15	Army Equipment Data Sheets—Chemical Weapons and Defense Equipment.

A–3. Technical Bulletins

TB 55–9150–200–25	Engine and Transmission Oils, Fuels, and Additives for Army Aircraft.

A–4. Army Regulations

AR 10–5	Department of the Army.
AR 10–7	United States Continental Army Command.
AR 10–11	United States Army Materiel Command.
AR 10–12	United States Army Combat Developments Command.
AR 10–13	United States Army Strategic Communications Command.
AR 11–8	Logistic Policies and Procedures.
(S) AR 11–12	Supply Priorities (U).
AR 55–355	Military Traffic Management Regulation.
AR 117–5	Military Mapping and Geodesy.
AR 210–21	Training Areas and Facilities for Ground Troops.
AR 220–10	Preparation for Oversea Movement of Units (POM).
AR 230–5	Nonappropriated Funds and Related Activities—General Policies.
AR 310–3	Department of the Army Publication; Preparation, Coordination, and Approval.
AR 310–32	Organization and Equipment Authorization Tables; Personnel.
AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Codes.
AR 330–10	Data Processing Units.

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A-4. Army Regulations—Continued

AR 385-62	Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat.
AR 385-63	Regulations for Firing Ammunition for Training, Target Practice, and Combat.
AR 385-80	Nuclear Reactor, Health and Safety.
AR 611-101	Manual of Commissioned Officer Military Occupational Specialties.
AR 611-201	Enlisted Military Occupational Specialties.
AR 612-35	Preparation of Replacements for Oversea Movement (POR).
AR 700-12	Control, Supply, and Positioning of Materiel.
AR 700-26	Designating and Naming Military Aircraft.
AR 700-33	Cargo Unitization.
AR 701-5	Materiel Management Responsibilities—Federal Supply Classification (FSC) Class Assignments.
AR 711-16	DSU/Installation Stock Control and Supply Procedures (Army Field Stock Control System).
AR 725-50	Requisitioning, Receipt, and Issue System.
AR 740-12	Covered and Open Storage of Supplies.
AR 750-1	Maintenance Concepts.
AR 750-4	The Army Materiel Plan—Part II: Depot Materiel Maintenance and Support Activities.
AR 750-5	Organization, Policies, and Responsibilities for Maintenance Operations.

A-5. Pamphlets

DA Pam 310-1	Index of Administrative Publications (Army Regulations, Special Regulations, Circulars, Pamphlets, Department of the Army Posters, Joint Chiefs of Staff Publications, and General Orders).
DA Pam 310-2	Index of Blank Forms.
DA Pam 310-3	Index of Doctrinal, Training, and Organizational Publications.
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9). Supply Bulletins, and Lubrication Orders.
DA Pam 310-6	Index of Supply Catalogs and Supply Manuals (Excluding Types 7, 8, and 9).
DA Pam 310-7	Index of Modification Work Orders.
DA Pam 310-8	Index of Army Personnel Tests and Measures.
DA Pam 310-35	Index of International Standardization Agreements.

A-6. Supply Bulletins

SB 1-1	Army Aircraft Flying Hour Factors and Forecast.
SB 3-34	Maintenance Float, CBR Equipment.
SB 3-39	Basic Loads of Chemical Nontoxic Ammunition.
SB 9-140	Field Maintenance Floats: Major Items of Equipment Authorized for Stockage in Both Peacetime and Wartime.
SB 10-495	Standard "B" Ration for the Armed Forces.
SB 10-496	Supply Control Wartime Replacement Factors and Consumption Rates for DSA/GSA Assigned (Quartermaster-Type) Items.
(C) SB 38-26	Ammunition Supply Rates (U).
SB 700-20	Army Adopted Items of Materiel.
SB 710-2	Supply Control: Combat Consumption Rates for Ground and Aviation Type Petroleum Products.

A–7. Miscellaneous

JCS Pub. 2	Unified Action Armed Forces (UNAAF).
TA 50–922	Chaplain and Chapel Facilities.
TA 50–989	Allowances of Expendable Supplies for Chaplain and Chapel Facilities.

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